

General, Installation, Commissioning & Maintenance Handbook

for

Stratos Outstation

667/HB/52250/000

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SAFETY INFORMATION



IT IS RECOMMENDED THAT DUE TO THE HAZARDS PRESENT WITHIN THE STRATOS OUTSTATION ALL POWER TO THE UNIT IS DISCONNECTED BEFORE WORKING ON THE UNIT (EXTERNAL MONITORED SUPPLIES MAY STILL BE CONNECTED WHEN THE UNITS MAINS SUPPLY HAS BEEN ISOLATED). WHERE A RISK ASSESSMENT AND METHOD STATEMENT FOR THE WORKS TO BE COMPLETED AND / OR THE INSTRUCTIONS FOR THE OEM EQUIPMENT BEING INSTALLED OR REMOVED ALLOWS, LIVE WORKING MAY BE CONSIDERED.

Safety of Maintenance Personnel

In the interests of health and safety, when using or servicing this equipment the following instructions must be noted and adhered to:

- Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical/electronic equipment are to be allowed to use and/or work on the equipment. All work shall be performed in accordance with the Electricity at Work Regulations 1989 or the relevant local, state and government regulations.
- Such personnel must take heed of all relevant notes, cautions and warnings in this Handbook and any other Document or Handbook associated with the equipment including, but not restricted to, the following:
 - The equipment must be correctly connected to the specified incoming power supply.
 - The equipment must be disconnected / isolated from the incoming power supply before removing any protective covers or working on any part from which the protective covers have been removed.
 - Any power tools must be regularly inspected and tested.
 - Any ladders used must be inspected before use to ensure they are sound and not damaged.
 - When using a ladder, before climbing it, ensure that it is erected properly and is not liable to collapse or move. If using a ladder near a carriageway, ensure that the area is properly coned and signed.
 - Any personnel working on site must wear the appropriate protective clothing, e.g. reflective vests, etc.



There are various RJ45 connectors used to connect to peripheral boards within the Stratos Outstation. Most are **not** Ethernet ports (See Figure 4) and should not be connected to other equipment, including PCs to avoid damage to the Stratos Outstation or user equipment.

The configuration process should only be carried out by persons who are adequately trained, have a full understanding of the needs of the county or region where the unit is to be used and are experienced in the tasks to be undertaken.

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Safety of Road Users

It is important that all personnel are aware of the dangers to road users that could arise during repair and maintenance of traffic control equipment.

Ensure that the working area is coned and signed as necessary to warn motorists and pedestrians of any dangers and to help protect the personnel working on the site.

Safety Warning – Lead Acid Battery

This equipment may contain a sealed lead acid battery depending on variant type.

Do not short circuit, puncture, take apart, incinerate, crush, immerse, force discharge, ingest or expose to temperatures above the declared operating temperature range of the product, otherwise there is a risk of fire or explosion.

Batteries should be handled and stored carefully to avoid short circuits. Do not store in disorderly fashion, or allow metal objects to be mixed with stored batteries. Keep batteries between 0°C and 35°C for prolonged storage.

The battery is a sealed unit which is not hazardous when used according to these recommendations. Do not breathe vapours or touch any internal material with bare hands should the battery become damaged in any way.

Battery disposal method should be in accordance with local, state and government regulations. In many countries, batteries should not be disposed of into ordinary household waste. They must be recycled properly to protect the environment and to cut down on the waste of precious resources.

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1 INTRODUCTION

1.1 Purpose

This handbook gives details of the facilities available in the Stratos Outstation and describes the procedures for the Installation and Commissioning and provides guidance on routine maintenance and fault finding:

Sections 2 to 3 cover the general operation and product features.

Section 4 details the hardware components and connections.

Section 5 details the Installation & Commissioning process.

Section 7 covers maintenance.

1.2 Contact Us

If you have any comments on this handbook, need any further information or need to contact Poole Engineering you can contact us at trafficwebmaster.stc@siemens.com.

1.3 Related Documents

667/HU/46000/000	User Interface Handbook (ST950 & Stratos Outstation)
667/HB/46000/003	MOVA 7 Handbook (ST950 & Stratos Outstation)
667/HB/46000/004	UTMC OTU Handbook (ST950 & Stratos Outstation)
667/RE/29050/000	Siemens OID Elexon Codes
667/DZ/52250/000	Stratos Outstation Family Tree
667/HQ/46000/001	ST950/ Stratos Outstation Communication Connection Options Quick Start Guide
667/HQ/31601/001	MOVA Quick Start Guide for UTMC/ MOVA OTU and Stratos Outstation
667/HQ/32621/000	Gemini to TC12 Adaptor Quick Start Guide
667/HQ/31601/000	UG405 Quick Start Guide
667/CI/55220/000	Stratos Outstation UTMC Commissioning Data
667/CI/55220/002	Stratos Outstation SAT Sheet
667/HQ/31601/002	MOVA7 Alerts on UTMC/MOVA OTU
667/CI/45025/000	IP Router Installation Guide

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1.4 Abbreviations

AC	Alternating Current
CPU	Central Processing Unit
DC	Direct Current
ELV	Extra Low Voltage
ESP	Enhanced Serial Port
GSPI	Siemens proprietary protocol - General Serial Peripheral Interface
GPS	Global Positioning System
HPU	ST900/950ELV High Power Unit
IDB	Intelligent Detector Backplane
I/O	Input / Output
IP	Internet Protocol
LED	Light Emitting Diode
LV	Low Voltage (Mains)
mA	milliamps
MDU	ST800/900/950 Mains Distribution Unit
MOVA	Microprocessor Optimised Vehicle Actuation
ms	milliseconds
NTP	Network Time Protocol
OTU	Outstation Transmission Unit
PSU	Power Supply Unit
UTC	Urban Traffic Control

1.5 Third Party Information

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- SD is a trademark of SD-3C, LLC in the United States, other countries or both.
- Linux is the registered trademark of Linus Torvalds in the U.S. and other countries.

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2 GENERAL

The Siemens Stratos Outstation provides UTMIC OTU and MOVA functions on a modular platform in a compact form factor.

2.1 Product Features

The main features of the Stratos Outstation are:

- MOVA7 and/or UTMIC OTU functionality.
- User interface with the same look and feel as Siemens ST950 Traffic Controllers.
- Date stamped rolling log providing detailed history of events and faults.
- Uncomplicated web browser user interface capable of multi-language support.
- Support for up to 152 input and 50 output lines via I/O boards.
- In-situ firmware updates.
- A Mass Storage device (Known as the Heart) contains restore points for the Outstation (firmware backups, configuration data, logs etc) allowing fast repair by board replacement and Mass Storage device transfer.
- Extended features licensed through encrypted license card.
- Two Integrated Ethernet interfaces.
- Four USB Host interfaces for memory devices, license card readers, WiFi dongle, optional RS232 handset adaptor.
- One USB Device interface for PC connection (web pages & command line interface).
- Mains powered with Inbuilt AC/DC Power supply.
- Internal 'last gasp' unit support battery.
- LV/ELV lamp supply monitor.
- Board interconnection via GSPI see section 4.2
- A detailed technical specification can be found in Appendix A.

2.2 Product Variants

The Stratos Outstation can be used in 3 main configurations:

- Semi-integral – Serial connection to controller.
- Freestanding – Serial and parallel connection to controller.
- TC12 to UTMIC OTU conversion – Free standing with TC12 I/O adaptor board.

The Stratos Outstation can be ordered in several rack configurations:

- No rack.
- 11" Rack.
- 19" Rack.

The full range of pre-built variants is shown in the product family tree: 667/DZ/52250/000.

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2.3 Product Overview

The Stratos Outstation provides control and monitoring of traffic controllers and other on-street equipment. The outstation provides an Ethernet port for IP connectivity to an installation.

The controller interface can be either semi-integral, where the data is transferred via RS232, or freestanding, where the interface is via individual I/O relay contacts. The interface summary for each controller type is given in the following table:-

Supplier	Controller	RS232 Protocol *	Interface type
Siemens	ST950	ESP #	Semi-integral
	ST800	ESP #	
	ST900	ESP #	
	ST750	ESP #	
	ST700	ESP #	
	T400	ASCII-7bit	Free Standing
	T500	ASCII-7bit	
Microsense / Telent	MPC	ASCII-7bit	
	MTC	ASCII-7bit	
	Sentinel	ASCII-7bit	
	Optima	ASCII-7bit	
Peek	TSC3	ASCII-7bit	
	TRX	ASCII-7bit	
	PTC-1	ASCII-7bit	
	TSP	ASCII-7bit	
Motus	TM150	ASCII-7bit	
	TM150 2P	ASCII-7bit	

* See section 5.6 for cables and baud rates.

ESP = Enhanced Serial Port, binary message protocol

Table 1 – Outstation / Controller Interface Summary Table

The semi-integral and freestanding interfaces are described in the sections below.

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2.3.1 Semi-Integral Interface to Controller

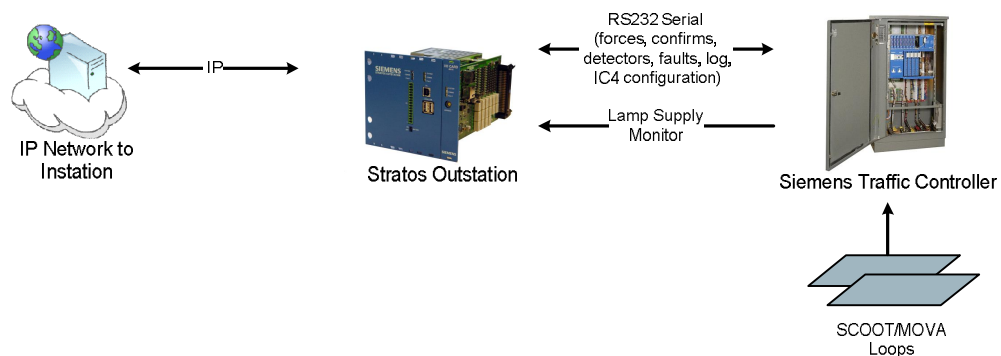


Figure 1 – Typical Semi-Integral Stratos Outstation Connectivity

The following data is transferred between the controller and the outstation via RS232 serial cable.

- UTC control and reply signals (stage force, confirm etc) as configured by IC4
- MOVA stage forces and confirms as configured by IC4
- Selected controller detector states as configured by IC4, for use as UTC SCOOT detectors and MOVA detectors
- Faults, for display on outstation fault table
- Controller Log, for display on outstation web interface *¹
- IC4 configuration upload *²
- Remote handset text

* 1 - When interfacing to an ST950 controller, the controller log transferred to the outstation is a sub-set of the full log. The web interface on the ST950 should be accessed directly to examine the controller log details.

* 2 - When interfacing to an ST950 controller, the IC4 configuration file is not transferred to the outstation. The web interface on the ST950 should be accessed directly to upload the IC4 configuration.

A dedicated input is provided for the controller lamp supply voltage (see section 3.7).

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2.3.2 Freestanding Interface to Controller

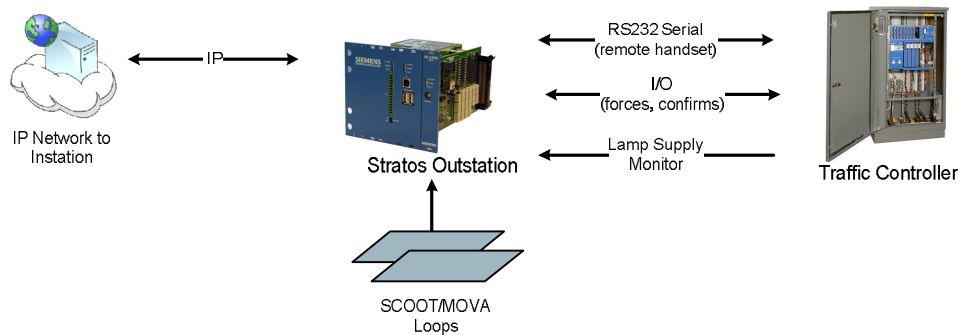


Figure 2 – Typical Freestanding Stratos Outstation Connectivity

The RS232 serial cable is used only for remote handset.

The following data is transferred between the controller and the outstation via TR2523 compliant voltage-free relay contacts.

- UTC control and reply signals (stage force, confirm etc)
- MOVA stage forces and confirms

Detectors for SCOOT and UTC are wired directly to the outstation.

A dedicated input is provided for the controller lamp supply voltage (see section 3.7).

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3 PRODUCT FEATURES DESCRIPTION

3.1 UTMC OTU

The UTMC OTU application implements both the Simple UTC MIB (TS004.004:2008 UM/004) and the Full UTC or UG405 MIB (TS004.004:2008UM/008).

The facilities are described in detail in the UTMC OTU Handbook 667/HB/46000/004.

3.2 MOVA (Microprocessor Optimised Vehicle Actuation)

The MOVA algorithm monitors the movement of vehicles through an intersection and then adjusts the operation of the controller to optimise its flow. The Stratos Outstation implements MOVA7.

Up to four MOVA 'kernels' (instances of the MOVA application) can be enabled with the appropriate licenses, with each MOVA 'kernel' controlling and monitoring one stream of the traffic controller.

The MOVA facilities are described in detail in the MOVA Handbook 667/HB/46000/003.

3.3 Digital Input /Output

The Stratos outstation can be fitted with various I/O options for connection to detection equipment and freestanding interface to controllers.

The integrated PSU board (section 4.6) includes a small number of I/O.

A maximum of three 48-16 I/O boards (section 0) can be fitted to the Stratos Outstation. This provides a maximum general purpose I/O count for a Stratos Outstation as:

Inputs:

3 x 48-16 I/O boards: 48 x 3 inputs = 144 inputs
16 x 3 outputs = 48 outputs

Plus

1 x PSU board: 8 inputs
2 outputs

Total: 152 inputs, 50 outputs

It is also possible to connect the Intelligent Detector Backplane kit 667/1/32910/950 for connection to loop detectors (section 4.9).

3.4 Backup Power for Last Gasp Dial

The inbuilt backup battery will be adequate for most backup applications where the Stratos Outstation must communicate the power loss state to an in-station. The battery backup period is set in firmware to 1 minute. After this time the Stratos Outstation will switch itself off. Typically the backup power will also support any connected 48-16 IO cards and a range of communications devices (e.g. IP router). The main supply (either AC mains or 24V) must be re-instated for the unit to power on. The 1 minute period will be sufficient in most cases for the communications to take place (last gasp dial). This period

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protects and maximizes battery life. For more information see section 4.7 and the IP Router Installation Guide 667/CI/45025/000.

3.5 Clock System

The software real time clock that controls the system records seconds, minutes, hours, day, month, year and day of week. The clock also has a standby RTC circuit which remains supported during power failures for up to 48 Hours.

An external RTC backup input on the CPU board (Modem Power Connector Pin 4 - Table 5) can be linked to the RTC output on the PSU board (General Functions Connector Pin 1 - Table 12) to provide extended RTC backup from the lead acid battery.

The clock can be synchronised to network time (NTP) over a suitable IP network. NTP synchronisation is required for UG405 UTC operation.

3.6 Self-Test Facility

The Self-Test functionality is primarily intended for factory testing as many of the tests require special loopback adaptors. The feature may prove useful when diagnosing certain faults in the field. Self-Test checks as much of the hardware as possible and may be run on demand from the Tester webpage. It is a completely separate function provided by the firmware.

The self test facilities are described in detail in section 6.

3.7 Lamp Supply Monitoring

The Lamp supply monitor provides a means to check that the lamp supply voltage is dim or bright and within specification. The two terminal input can accept either LV or ELV voltages. Connect the lamp supply to the two pin Lamp Supply Monitor Connector on the PSU Board (section 5.9).

Currently the lamp supply RMS voltage is available via the webpage real time view (see below); however future software features will integrate this information with the instation for monitoring.

Webpage - Status and Configuration – System – Status – Real Time View
then selecting *Stratos – Lamp Supply Voltage*.

3.8 User Interface

The primary interface for user actions is a web based interface available locally over the USB handset port and WiFi (with suitable USB WiFi dongle) and on a network via the Ethernet interface. This interface gives access to and control of all areas necessary for day to day maintenance including:

- System Status and Configuration.
- System Log.
- Fault Table.

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A command line text interface is also available (e.g. for use with remote terminals or handset connection) along with a simple text based menu system to allow straightforward maintenance without the need for knowledge of handset commands or use of a PC.

The User Interface is described in detail in the User Interface Handbook 667/HU/46000/000.

3.9 Fault Table

The Fault Table shows faults and notifications that are currently active.

A *fault* is an abnormal condition which requires corrective action to be taken.

A *notification* provides information to the user but does not necessarily require any immediate action.

Many faults will be automatically removed from the Fault Table when the condition which caused the fault is removed. Some faults are latched and require manual clearing. A button is displayed next to this latter type of fault which can be used to clear the fault. To clear the fault, press the button and follow the instructions.

For more information see the User Interface Handbook 667/HU/46000/000.

3.10 System Log

Important events are recorded in the System Log. The source of the event with the date and time at which the event occurred is recorded along with an indication of its severity:

- Error
- Notice
- Warning
- Information

With the default logging level configuration, only events with severity level of “Notice” and “Error” are recorded in the System Log. The logging level can be configured separately for each software function.

For more information see the User Interface Handbook 667/HU/46000/000.

3.11 Site Log

The Site Log records significant site events. System firmware update is automatically recorded in the site log. It is also possible for the user to create text records, either with or without a file attachment.

Attachments can be useful to record site details through diagrams, photographs, documents, etc.

For more information see the User Interface Handbook 667/HU/46000/000.

3.12 Remote Reboot

Remote reboot allows the Stratos Outstation to be rebooted. This function is available on the System web page.

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3.13 Inventory Information

Where available, inventory information is collected about the various assets within the system (software and hardware). This information is available from the web page:

Status and Configuration – System – Status – Inventory – Devices

For more information see the User Interface Handbook 667/HU/46000/000.

The following boards contain inventory information:

Data	CPU	PSU	48-16 IO	TC12 Adaptor	IDB
Part Number	✓	✓	✓	✗	✗
Hardware Issue	✓	✓	✓	✗	✗
Serial Number	✓	✓	✓	✗	✗
Date of Manufacture	✓	✓	✓	✗	✗
Description	✓	✓	✓	✗	✗
Software part number(s) and Issue	✓	✓	✓	✗	✓

Table 2 – Board Available Inventory Data

3.14 Site Information Export

A summary of the current state of a site can be easily extracted for review and archive. The information can be extracted on demand and takes the form of a single compressed file containing the following information:

- System log
- Summary of current status
- Site log
- Hardware and firmware versions
- The current configuration data file
- Report of installed licences
- This export function is available from the System web page.

For more information see the User Interface Handbook 667/HU/46000/000.

3.15 Licensing

Certain features within the Stratos Outstation are licensed. Licences are distributed and held on Smart Cards. For storage on the unit, a SIM size Smart Card is fitted in the Smart Card holder on the CPU Board. Licences are easily installed onto a Stratos Outstation either by mounting the licence Smart Card on the CPU Board or, if a card is already fitted, transferring the licence onto the fitted card using a USB Smart Card reader. Refer to the User Interface Handbook 667/HU/46000/000.

A summary of the available licences is shown in Table 3.

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Part Number	Licence Description
667/1/47560/000	LIGHTWEIGHT TUNNEL (VPN)
667/1/47562/000	MOVA 7 STREAMS 1 AND 2
667/1/47563/000	MOVA 7 STREAMS 3 AND 4
667/1/47568/000	UTMC OTU (Stratos) – Included as standard

Table 3 – Available Licences

3.16 The Heart

The Heart holds a backup of the system which can be used to:

- Clone the system onto a replacement CPU Board if the original requires replacement.
- Return the system to an earlier state.

All aspects of the system are recorded in the backup including firmware, fault logs, configuration and all changes made to the point at which the backup was taken.

The Heart is implemented using an SD card Mass Storage device fitted to the CPU Board.



The formatting of the card is such that it is not readable in a PC. There are no user files accessible on the card.

Backups are created and written to the Heart periodically, usually at 00:30am but this can be changed if required. Backups can also be created and saved on demand.

For more information see the User Interface Handbook 667/HU/46000/000.

3.17 Firmware Update

Most of the firmware within the unit is stored in non-removal devices. This firmware can be updated by the user. The following firmware can be upgraded in this way:

- CPU board
- Peripheral boards (48-16 I/O board and PSU board)

For more information see the User Interface Handbook 667/HU/46000/000.

3.18 OSS

The Outstation Support Server (OSS) provides centralised management of controllers and other types of outstation units. Installation, licensing, maintenance and use are fully described in 667/HB/31760/100 (Outstation Support Server Handbook).

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4 SYSTEM COMPONENTS

4.1 System Block Diagram

The Stratos Outstation is a modular product that can be configured to provide many functions. The main components and connections of the Stratos Outstation are shown in Figure 3. General assembly drawings for the main components are shown in appendices.

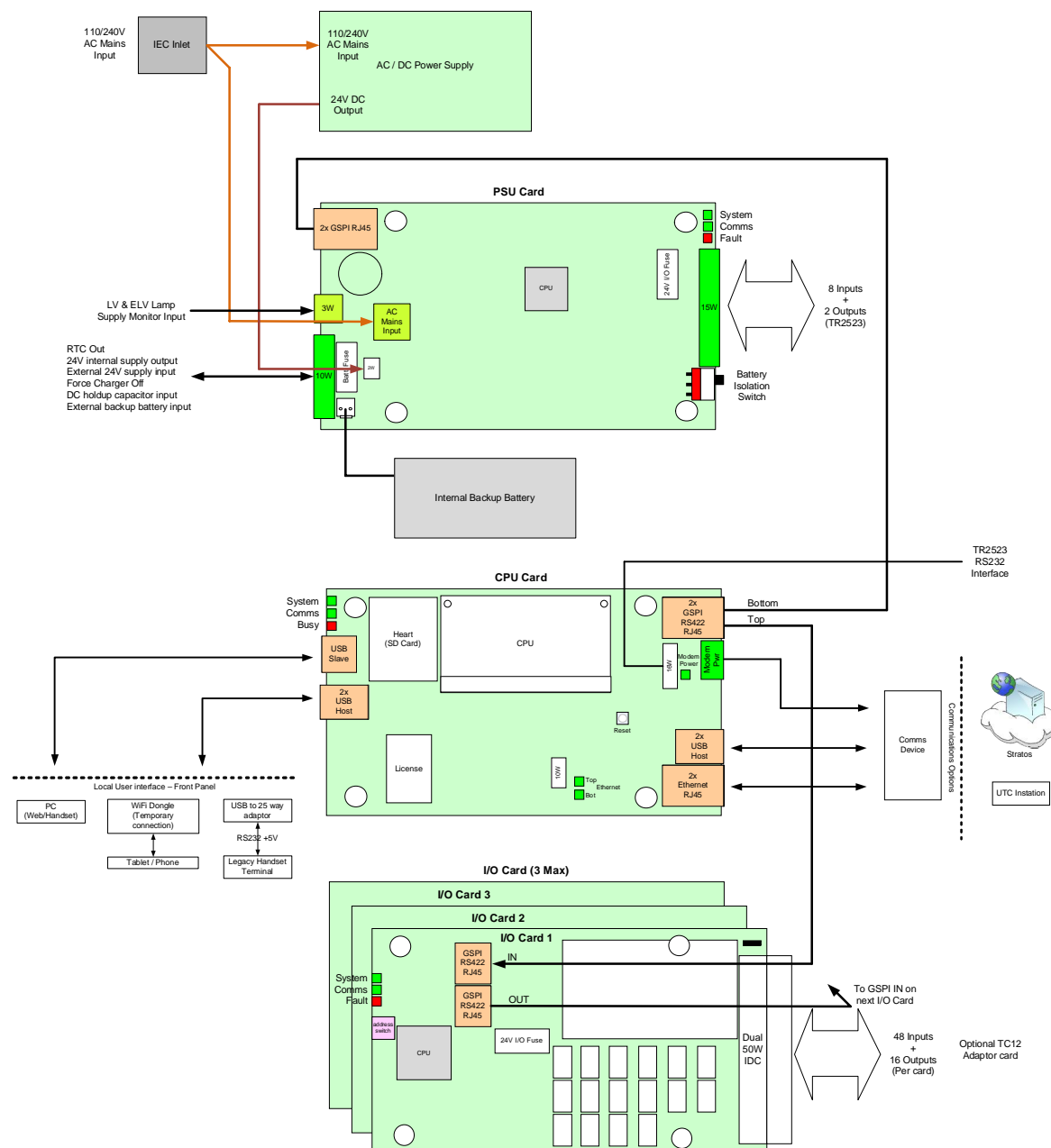


Figure 3 – Stratos Outstation System Overview

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4.2 GSPI

The Generic Serial Peripheral Interface (GSPI) Bus is used within the system to connect serial communications and power to the main intelligent components of the system. In the Stratos Outstation the power source on the GSPI bus is the PSU board, but the communications master is the CPU board.

The CPU board provides two RJ45 connectors to downstream peripherals both which are on the same communications Bus. On each peripheral there are also two RJ45 connectors with “IN” and “OUT” connections allowing connection in from the master and out to the next peripheral in the chain.

The PSU board, when powered from the Mains PSU module in normal powered mode provides power on both its upstream and downstream GSPI RJ45 connectors. When the Mains power fails and the unit enters battery backup mode the power is cut by software to peripherals on the downstream (“OUT”) side in order to preserve battery capacity.

For GSPI peripherals that have a general purpose I/O capability (e.g. the PSU board and the IO board) their IO is mapped into the CPU board in 8 bit ports for example: gspi1.in.0. For details on the I/O mapping process refer to the UTMIC OTU Handbook 667/HB/46000/004. For the IO port mapping for specific peripherals, then please see their respective section in this document.

4.3 Power Supply

The Stratos Outstation can be powered from a standard AC mains supply or an external DC supply.

The following supply voltages may be used:

Nominal Voltage	Minimum Voltage	Maximum Voltage	Frequency	Power Break Support Time
120V, 230V	90V	264V	50/60Hz +/-4%	50ms under max load*
24V External DC (refer to Engineering Poole for more information)	10V	28V	DC	Depends on external supply and backup battery configuration.
* If a backup battery is fitted, then support time will be 1 minute (software controlled). See section 3.4				

Table 4 – Power Supply Voltages

4.4 The CPU Board

The CPU board holds the configuration and performs the function of configuration, control and management. The CPU runs the Linux operating system and specific applications for functions such as MOVA7 and UTMIC OTU.

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The main external data interfaces of the CPU Board are:

- Serial Interfaces (GSPI) to I/O Boards and detectors (GSPI master)
- 2x 10/100 Ethernet Interfaces
- 4x USB Host interfaces
- RS232 interface to controller (TR2523 – formerly TR0141)
- RS232 interface to auxiliary equipment
- USB device interface for PC connection

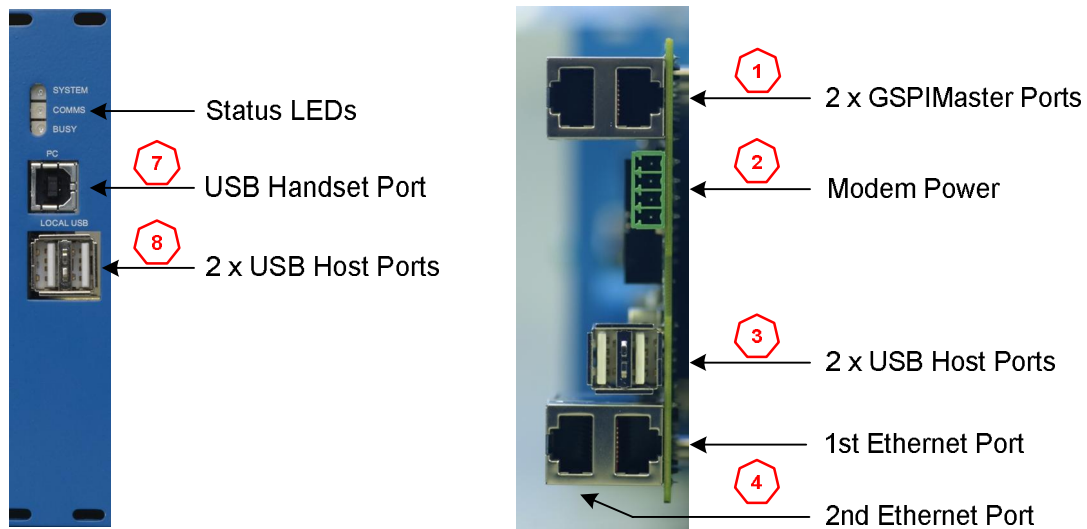


Figure 4 – CPU Board Front/Rear Connections

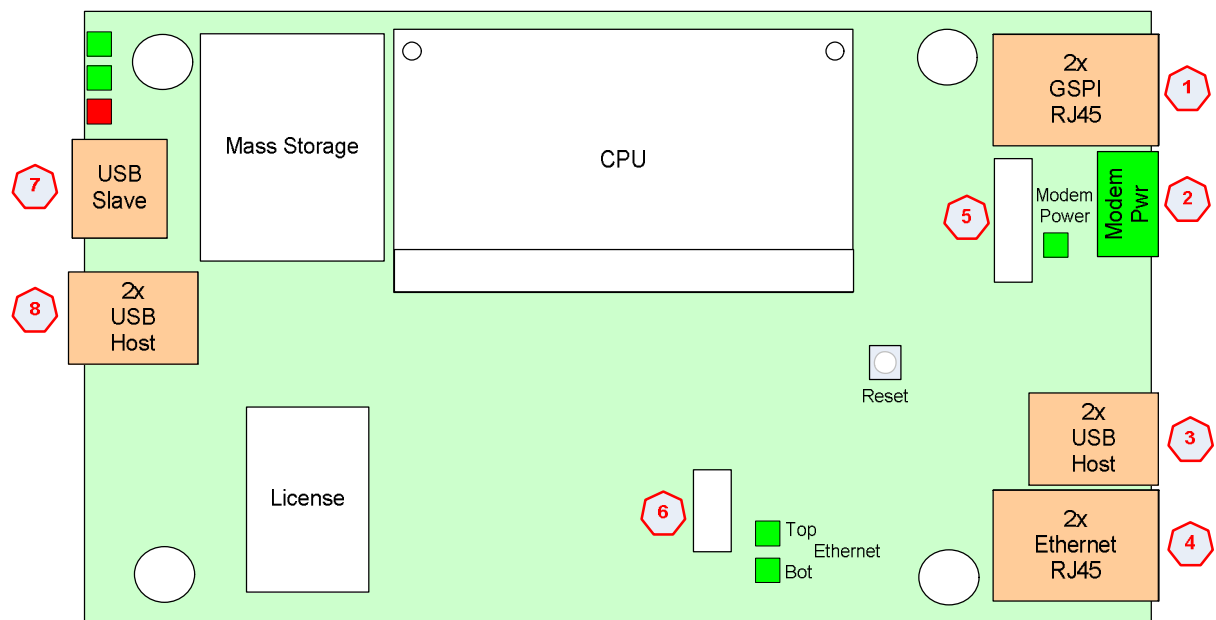


Figure 5 – CPU Board Layout

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	Description	Connector
1	2 x GSPI Bus master to GSPI Peripherals	Double RJ45
2	Modem Power See Table 6 for pinout	4 way 3.81mm pitch Phoenix
3	2 x USB Host Ports (rear)	Double USB Type A
4	2 x 10/100 Ethernet Ports (1 st port is closest to PCB)	Double RJ45
5	RS232 Port – TR2523	16 way IDC boxed header
6	RS232 Port – Modem, GPS etc	10 way IDC boxed header
7	USB Handset Port	USB Type B
8	2 x USB Host Ports (front)	Double USB Type A

Table 5 – CPU Board Connector Functions and Types



Modem Power
Pin 1

Pin	Function
1	+24V DC input – Power for CPU board when no PSU board is used
2	0V
3	Switched 24V (Nominal) Modem supply output *
4	Optional RTC supply input (3V to 28V DC)

Table 6 – 4 Way 3.81mm pitch – Modem power and DC Power



* Note that the modem supply will follow the battery backup supply during a mains failure. This output can range from 8 – 28V DC

For more information on supported communications devices and connection, please refer to the IP Router Installation Guide 667/CI/45025/000.

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4.4.1 CPU LEDs

LED	State	Description
SYSTEM (Green)	Slow flash	Normal operation
	Medium flash	Normal operation, Fault present
	Very fast flash	Restricted mode*
COMMS Communications (Green)	On	Under UTC control, pulses off indicate receipt of messages
	Off	Not under UTC control, pulses on indicate receipt of messages
BUSY (Red)	Off	Normally off
	Flashing	Flashes to indicate the system is busy performing an operation that must not be interrupted, for example start up, upgrade, USB "memory stick" style interface is busy. Do not remove USB device or switch off the outstation while this LED is flashing.
Ethernet Connectivity (2x Green inboard)	On / Flashing	Indicate activity for the two Ethernet interfaces. Top and Bottom
Modem Power (inboard)	On	Indicates that the Modem Power is on.
	Off	Indicates that the Modem Power is off.

* Restricted mode is similar to safe mode on a PC where the user can access the unit to examine logs, diagnose problems and perform firmware updates.

Table 7 – CPU Board LED States

4.4.2 Changing the Heart

The heart should only ever need to be replaced under the following circumstances:

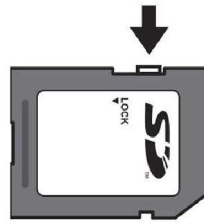
1. CPU Board or unit is faulty and needs to be replaced.
2. Heart (SD Card) is faulty.

Should the heart need to be removed or replaced the following procedure should be followed:

1. Power down the Stratos Outstation.
2. Unplug connectors and slide the unit free of any rack so that the top edge of the CPU board can be accessed.
3. Push the card into the socket slightly until it 'clicks' then release pressure. The card can now be pulled from the socket.
4. To insert a card, align it with the socket with the contacts facing PCB and closest to the socket. Slide it into the socket and apply slight pressure until it 'clicks'. The card is now located correctly. The photos below show the correct orientation for the card.

Note: It is important that the card is not write-protected. The 'lock' switch must be in the position shown in the following diagram.

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SD card Write Enable switch position



SD Card Orientation



✗ SD card partially inserted - incorrect



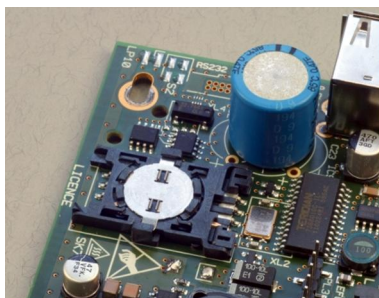
✓ SD card fully inserted - correct

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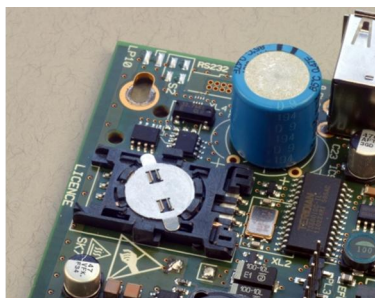
4.4.3 Installing a License Card

Should a License card need to be installed / replaced the following procedure should be followed:

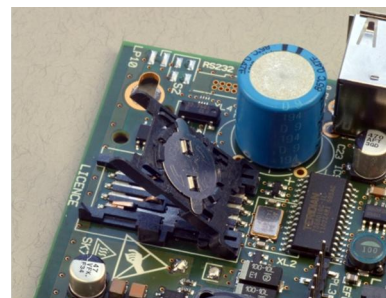
1. Power down the Stratos Outstation.
2. Unplug connectors and slide the unit free of any rack so that the bottom edge of the CPU board can be accessed.
3. Turn the circular metal locking ring with a finger to unlock the holder.
4. Lift the bottom edge of the card holder.
5. Insert the card in to the holder as shown – contact side towards board and chamfered edge towards bottom of board.
6. Lower the holder and return the locking ring to the locked position.



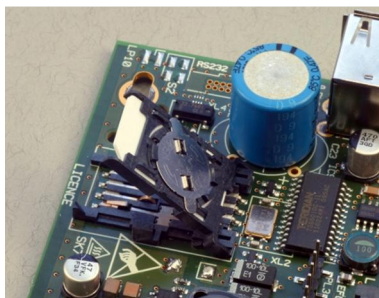
No License Card - Locked



No License Card - Unlocked



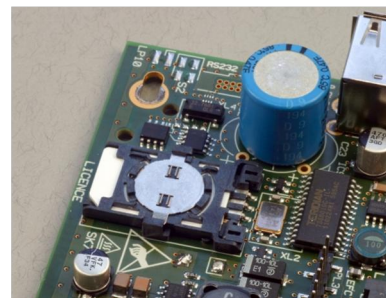
No License Card - Open



License Card - Inserted



License Card - Unlocked



License Card - Locked

For License installation see the User Interface Handbook 667/HU/46000/000.

4.4.4 Replacing the CPU card

Should the CPU card need to be replaced, see section 7.3.1 for details.

4.5 USB to 25 Way D Type Adaptor

A USB to 25W D type handset adaptor is available (667/1/47180/000), which allow connection from legacy 25 way handset terminals to the Outstation command line interface via the 2 USB host connections on the front of the CPU board. The cable comes with two USB connectors; these must be both connected to provide power and communications to the legacy handset device. The supported handset baud rates are 19200, 9600 and 1200 (all 7 data, even parity, auto baud). To reset the auto baud rate detection, the USB connectors need to be disconnected and reconnected.

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4.6 The PSU Board

The PSU board provides power for the system and provides application specific hardware modules to support specific functions. This board acts as a GSPI device to allow the CPU board to communicate with it.

The main functions of the PSU Board are:

- Logic rail power supplies
- Basic 8 input + 2 output TR2523 I/O
- Mains monitoring and Zero Cross Over timer (ZXO)
- Lamp Supply voltage monitoring (ELV & LV)
- Backup battery control – charging, health, safety

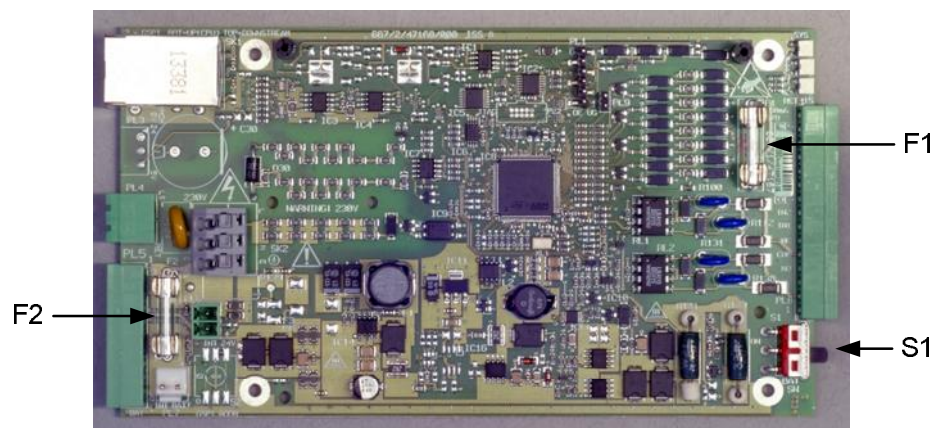


Figure 6 – PSU Board

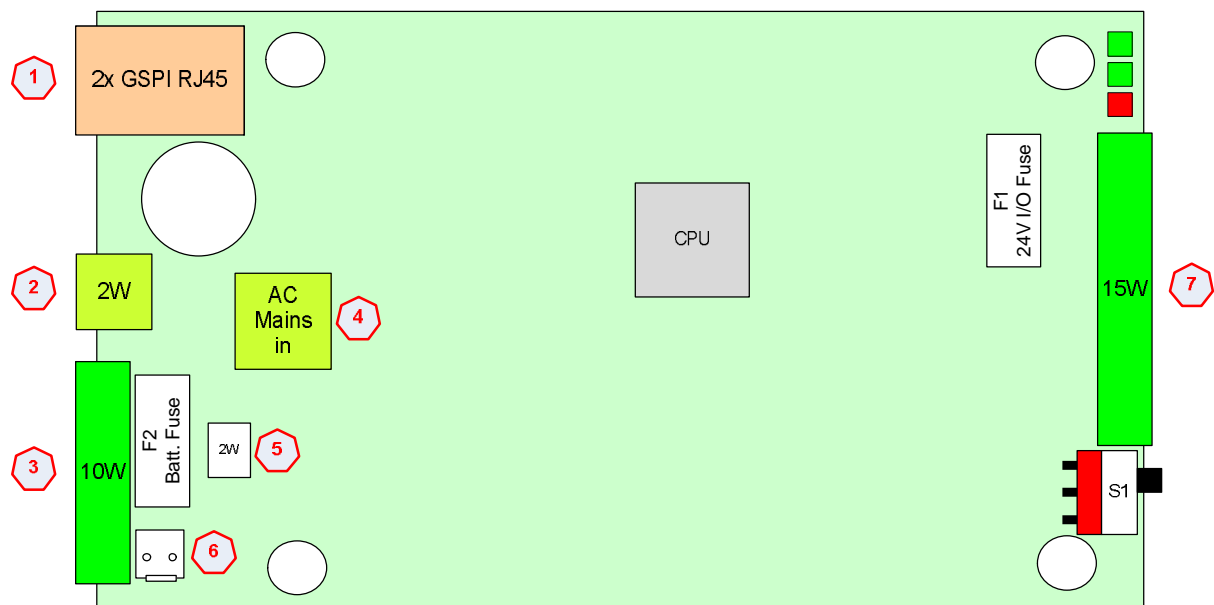


Figure 7 – PSU Board Layout

Note: This board is shown with the 'front' on the right as it is mounted back to back with the CPU board.

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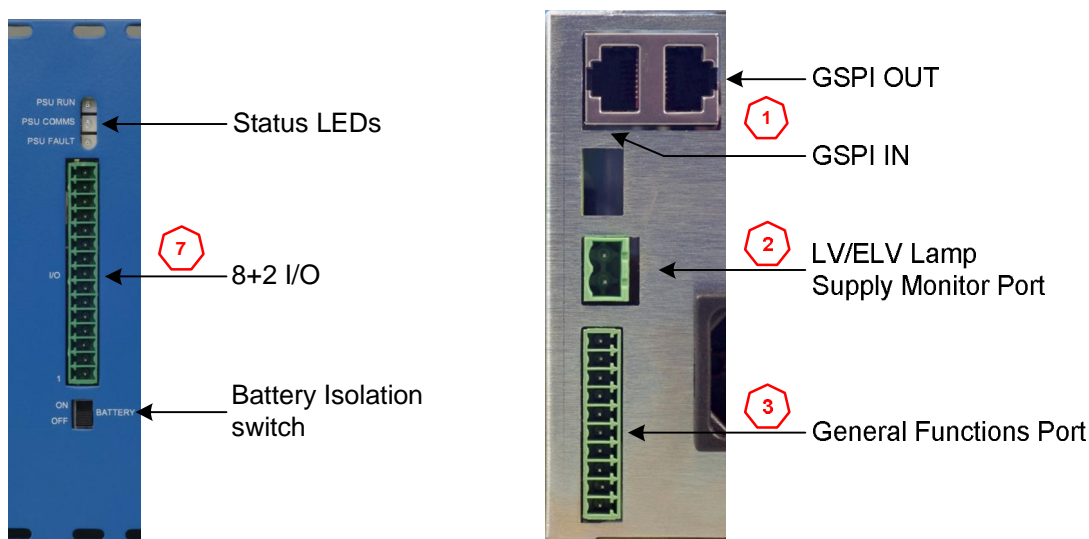


Figure 8 – PSU Board Front/Rear Connections

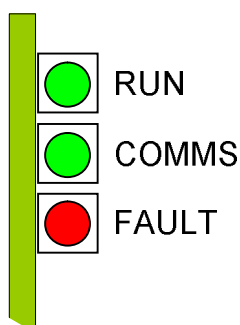
ID	Description	Connector
1	GSPI Bus – See Figure 8. Note. The PSU board, when connected in a Stratos Outstation provides power on the GSPI Bus. When in battery backed mode, the power is cut to the downstream peripherals (“OUT” side). See section 4.2 for more information.	Double RJ45
2	LV/ELV Lamp Supply Monitor Input See Table 12 for pinout	2 way 5.08mm pitch Phoenix See Appendix B for part No.
3	General functions See Table 13 for pinout	10 way 3.5mm pitch Phoenix See Appendix B for part No.
4	AC Mains input to board	Pre-wired – not for user
5	24V input from AC/DC PSU	Pre-wired – not for user
6	Internal battery backup (for lead acid battery)	2 pin JST header
7	TR2323 I/O Connector (8 inputs + 2 outputs) See Table 11 for pinout	15 way 3.5mm pitch Phoenix

Table 8 – PSU Board Connector Functions and Types

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4.6.1 PSU LEDs

The three LEDs on the front of the PSU board as shown below (viewed from the front).



LED	State	Description
SYS / RUN (Green)	Slow Flash	Normal Operation
	Medium Flash	Configuration or Firmware Download in progress
	Double Pulse	Low power mode (Future Feature)
COMMS (Green)	On	Normal operation, GSPI messages being received regularly
	Off	No relevant GSPI messages received in the last second (implies loss of communications), or low power mode
FAULT (Red)	Off	Normal operation
	On	Fault detected. See Table 10 for details
	Double Pulse	Firmware is in Error and low power mode

Table 9 – PSU & I/O Board LED States

4.6.2 PSU Faults

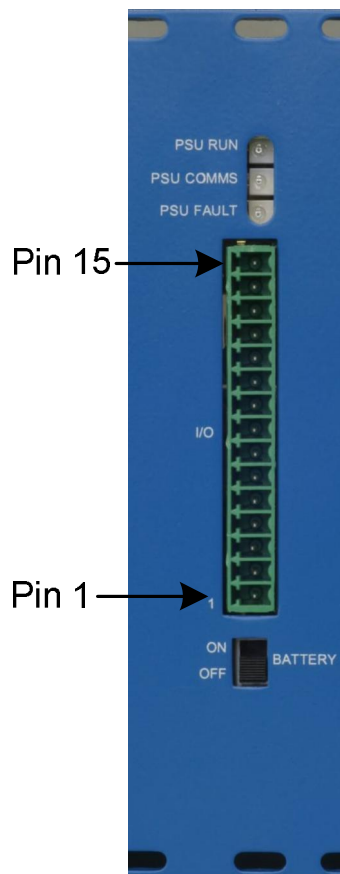
Presence of the following PSU board faults will cause the fault LED to be on. When the fault LED is illuminated the fault table webpage can be accessed to determine which of the following faults is present.

Fault	Possible cause/Remedy
Hardware error	Could be caused by one of the following <ul style="list-style-type: none"> 1. I/O fuse (F1) failure <ul style="list-style-type: none"> - replace the fuse (section 7.3.5) 2. PSU board hardware failure <ul style="list-style-type: none"> - replace the PSU board.
Supply voltage low (environment error)	The PSU board supply voltage has dropped below 8V

Fault	Possible cause/Remedy
Unrecognised hardware	Unable to interface with the EEPROM device on startup. Hardware error - replace the PSU board
Software error (includes – Checksum failure, Watchdog Failure, S/W general error, Initialisation failure)	Unlikely to occur. If observed report to Poole Engineering (see section 1.2) - Power cycle the Gemini3 unit if possible – to attempt to remove the fault

Table 10 – PSU board fault troubleshooting

4.6.3 Pinouts

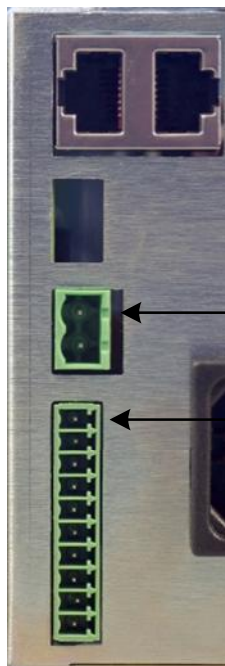


PSU Inputs and Outputs – 15 Way 3.5mm pitch

Pin	Function	Card/ Port	Bit ID		Loom Colours 667/1/30607/000
15	Input 8	Gspi15.in.0	8		Brown/Green
14	Input 7		7		Pink
13	Input 6		6		Grey
12	Input 5		5		Orange
11	Input 4		4		Violet
10	Input 3		3		Brown
9	Input 2		2		Yellow
8	Input 1		1		Blue
7	0V Common	-	-		White
6	N.C. O/P 2	Gspi15.out.1	2		Orange/Grey
5	Com O/P 2		2		Blue/White
4	N.O. O/P 2		2		Blue/Orange
3	N.C. O/P 1		1		White/Orange
2	Com O/P 1		1		Red/White
1	N.O. O/P 1		1		Red/Orange

Table 11 – PSU Inputs and Outputs - 15 Way 3.5mm pitch

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Lamp
Supply
Pin 1

Pin 1
General
Functions

LV/ELV lamp supply input - 2 Way 5.08mm pitch

Pin	Function
1	230V Mains supply (LV) or -48V (ELV)
2	Return (Neutral for LV, 0V for ELV)

General Functions - 10 Way 3.5mm pitch

(see Table 13 below)

Table 12 – Lamp Supply & General Functions Connector Pinout

The individual pin functions are fully described in Table 13 below. A basic description of the pinouts for all PSU connectors can be found on the battery cover.

Pin	Function	Description
1	RTC Out	This provides a Power feed from the PSUs internal backup battery that can be connected to the CPU board Optional RTC supply input on the modem power connector pin 4 to allow the RTC backup time to be extended (almost indefinitely due to the size of the backup battery).
2	24V Internal Supply Output Backed-up	Internal 24V DC power is available on this pin if required externally to drive auxiliary equipment. This voltage is identical to the 24V output on CPU board modem power connector pin 1, i.e. it is backed up at 12V by the battery during mains power loss.
3	0V	Common supply return

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Pin	Function	Description
4	External 24V - Input / Output	<p>Disconnection of the internal power supply at the internal 2-way 24V connector allows external 24V DC power to be supplied to the system via this pin instead of using the internal power supply.</p> <p>This pin also provides access directly to the 24V of the internal PSU and could be used to power external equipment if it is desired to have no battery backup for the external load (power on this pin is fully removed when mains power is lost).</p>
5	0V	Common supply return
6	Force Charger Off	This active low signal when shorted to 0V will disable the internal battery charger.
7	0V	Common supply return
8	DC holdup capacitor (Future Option)	Not used. An optional variant could be created in future which provides additional hold-up capacitance on 24V DC, and on such a variant the hold-up capacitance could be expanded by connecting an external capacitor to this pin.
9	0V	Common supply return
10	External battery input	If the internal battery is disconnected at the 2-way battery connector and removed, an external 12V lead-acid or lead-crystal battery can be connected to this pin with positive to pin 10 and negative to pin 9. An external battery must be fused externally with an in-line fuse holder and 5A quick blow fuse.

Table 13 – General Functions Detailed Description

4.6.4 Switches and Fuses

The PSU board contains two fuses and one switch:

Designation	Description	Value	Part Number
F1	24V I/O Fuse	160mA Quick Blow	518/4/90285/020
F2	Internal battery fuse	5A Quick Blow	518/4/90285/008

Table 14 – PSU Board Fuses

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Designation	Description
S1	Battery isolation switch. Isolate battery before transportation.

Table 15 – PSU Board Switches

4.6.5 Changing Fuses

See section 7.3.5 for fuse change procedure.

4.6.6 PSU Board address

The PSU board is a GSPI peripheral and as such is addressed in the normal way as an I/O board. The address is fixed at 15 and is not user selectable.



Address 15 must not be used by any other GSPI peripheral if a PSU board is present in the system.

4.6.7 Replacing a faulty PSU board

The PSU board is not considered to be a field replaceable part as the unit needs to be fully disassembled to replace it. If the PSU board is thought to be faulty, return the complete unit for repair.

4.7 Inbuilt Backup Battery

The inbuilt sealed lead acid backup battery should be replaced as routine maintenance typically every 3-5 years under normal circumstances to ensure that the backup time is adequate for instation communications during a power failure. The battery test (see below) can be used to determine exactly when to replace the battery.

If the application demands backup at extremes of temperature (outside -20°C to +60°C), then an external battery can be connected to the Power supply board via the rear 10 way connector. If this option is used, note that:

1. The internal battery **MUST** be disconnected. Unplug and/or remove the internal backup battery as described in section 7.3.4.
2. Any external battery **MUST** be a lead acid type and 12V.
3. The external lead acid battery is should be connected to the General Functions connector, negative to pin 9, Positive to pin 10 – refer to Table 13.
4. An external battery **MUST** be fused externally with an in-line fuse holder and 5A quick blow fuse.
5. The internal battery charger will charge an external lead acid battery.
6. There is no limit to the size/capacity of any external battery. The system firmware will automatically shut the system down after 1 minute following a power failure so there is no benefit in increasing external battery capacity above the capacity required for 1 minutes running at the system load and with minimum operating temperature in mind (where battery capacity is reduced).

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A self test function is provided to test the internal backup battery. The following self tests run automatically with no user input required:

Battery presence self test

- Runs on startup and then every 3 minutes*¹.
- Test ensures the battery is connected and maintains a minimum voltage.

Battery capacity & on-load self test

Runs 7 days after initial startup and then every 30days*¹ *²

- Test results provide an indication of the capacity of the battery. These indications allow the user to determine if the battery requires replacement.
- The capacity test connects the battery to a test load for 60 minutes. During the test the battery voltage is continually monitored. The test is passed if the battery voltage remains above a minimum value throughout. If the battery voltage falls below the minimum value, the test is stopped and failed. The length of time taken for the test to fail is used to estimate the remaining capacity of the battery. Therefore the capacity test result either shows a pass or the estimated remaining fully charged capacity (where 25% suggests the battery is only capable of retaining a quarter of the charge of a brand new battery).
- The on-load (impedance) test compares the unloaded and loaded battery voltage. This battery voltage drop is compared against the user configured threshold value. The on-load test result shows a pass if the on-load voltage drop is less than the threshold value, if not the actual on-load voltage drop is displayed.
- The battery capacity & on-load test results notifications and thresholds are configurable. The user can choose to turn these notification warnings off and vary the thresholds at which the warning notifications are generated. See the 'User Interface Handbook for ST950 and Stratos Outstation' 667/HU/46000/000 section 15.2.3.

The following fault/notification table and system log messages are generated from the battery self tests and continued monitoring. These messages allow the user to determine the health of the inbuilt battery.

Fault/Notification Table (& system log) message	Possible Cause & Remedy
'Card 15, Support Battery Not Detected'	Indicates battery is not connected. – connect battery to PSU board.
	If battery is connected this indicates the battery is faulty. – replace battery.
'Card 15, Support Battery Isolated'	Battery isolation switch on PSU board front panel is in the 'OFF' position. – move switch to 'ON' position to connect the battery.

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Fault/Notification Table (& system log) message	Possible Cause & Remedy
'Card 15, Support Battery Charger Forced Off'	<p>Battery charger has been disabled by the user. Pin 6 of the 'General functions connector' (located at rear of the PSU board) has been taken to 0V. This may be required if an external battery is being used.</p> <ul style="list-style-type: none"> – to enable the charger ensure pin 6 is left unconnected (floating).
'Card 15, Support Battery Charger Disabled – Temperature Out of Range'	<p>Ambient temperature is outside the battery operation range (-20°C to +60°C). The battery will continue to be used to provide backup power in the event of a mains power failure, however hold up cannot be guaranteed as the battery charge will not be maintained.</p>
	<p>If the ambient temperature is comfortably within the battery operation range, this suggests there is a hardware fault on the PSU board.</p> <ul style="list-style-type: none"> – Check if the PSU board has also logged a 'Hardware error'. Replace the PSU board.
'Card 15, Support Battery Capacity Low (xx%)'	<p>The 30 day battery capacity test failed to complete. The expected battery voltage was not maintained for greater than the configured 'Battery Capacity Low threshold' value. This indicates the battery capacity has reduced significantly*³.</p> <p>As a guide:</p> <ul style="list-style-type: none"> – If the estimated battery capacity is less than 10% the battery should be replaced immediately, as it is unlikely the battery will be able to provide backup power for the required 1 minute period. – If the estimated battery capacity is between 10%-25%, the user is advised to replace the battery at the next convenient opportunity.
'Card 15, Support Battery On-load Voltage Drop x.xV'	<p>The 30 day on-load test failed. The On-load voltage drop is greater than the configured 'Battery Voltage Drop Threshold' value. This indicates the battery capacity has reduced significantly*³.</p> <p>The battery capacity test result provides the best indication of when the battery needs to be replaced. The on-load test result can be used in conjunction to provide further assurance of when the battery should be replaced. A voltage drop greater than 1.5V would support the need to replace the battery immediately.</p>

Table 16 – Inbuilt battery backup troubleshooting

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Note *¹ Providing none of the following conditions are true:

Ambient temperature extreme (outside of battery charging range which is -20°C to +60°C).

Battery providing backup power.

Battery high voltage fault.

Battery charger forced off by user.

Under these conditions the battery self tests are inhibited and do not run.

Note *² - The test is delayed if the temperature is outside the battery range or if there has been a mains failure in the previous 12 hours.

Note *³ - It is not possible to precisely specify the point at which the battery is deemed faulty and should be replaced. The battery capacity and on-load test results allow the user to determine what constitutes a faulty battery. The user can extract the previous battery capacity and on-load test results from the system log. This data can be used to help understand how quickly the battery capacity has taken to decline, and determine when the battery will need to be changed. A battery capacity test pass indicates the battery capacity is greater than 25%, however, the test is indicative only as the actual support time required will depend on the equipment connected.

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4.8 The 48-16 I/O Board

The I/O board provides TR2523 compliant input and output functions for the system (48 inputs and 16 outputs). This board acts as a GSPI device to allow the CPU board to communicate with it. This board is known as the 48-16 I/O Board to identify it against the ST950 I/O boards.

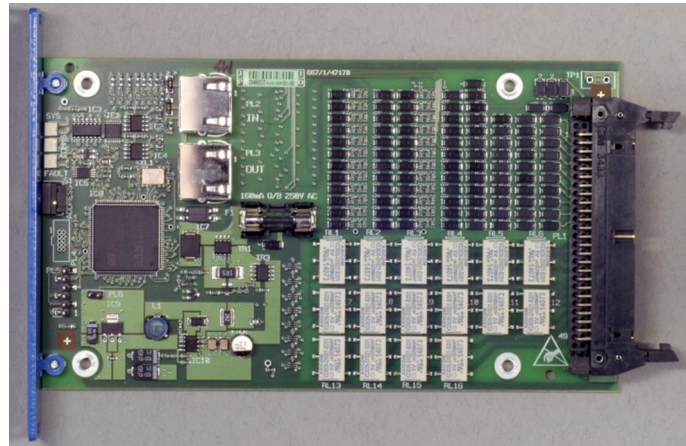


Figure 9 – 48-16 I/O Board

The main functions of the I/O Board are:

- 48 inputs (for detectors, push buttons etc)
- 16 isolated changeover relay contact outputs
- I/O connector is compatible with Gemini2 Bus/MOVA I/O board pinout
- GSPI pass-through connection for daisy chaining of GSPI peripherals
- Powered by the GSPI Connection

Inputs

The I/O board inputs are compliant to TR2523:2005 as follows:

- Closed-Circuit is indicated when a resistance of 250 Ohms or less is present across the input terminals.
- Open-Circuit is indicated when a resistance of 100K Ohms or greater is present across the input terminals.
- The open-circuit voltage across the input terminals is typically less than 24V DC.
(Will track backup battery voltage during the backup period)
- The short-circuit current is typically less than 2.5mA.
(Will be lower during backup period as the input voltage tracks the backup battery voltage)

In practice, any resistance across the input terminals that results in a voltage of greater than 7.5V across the input terminals will be read as Open-Circuit.

Any resistance across the input terminals that results in a voltage of less than 2.5V across the input terminals will be read as Closed-Circuit.

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Outputs

The I/O board outputs are volt-free fully isolated outputs that are compliant with TR2523:2005 as follows:

- Maximum ON resistance of 185Ohms.
- When ON, an output is rated at 50mA maximum.
- When OFF and output will withstand 75V DC continuous.
- When OFF and output will present a resistance of greater than 100K Ohms.
- The COMMON, NORMALLY OPEN and NORMALLY CLOSED contacts of each output are isolated from any other.



The relay contacts are NOT rated for AC mains operation. The maximum operating voltage for each relay contact is 75V AC/DC. The inter-relay voltage must not exceed 150V AC/DC.

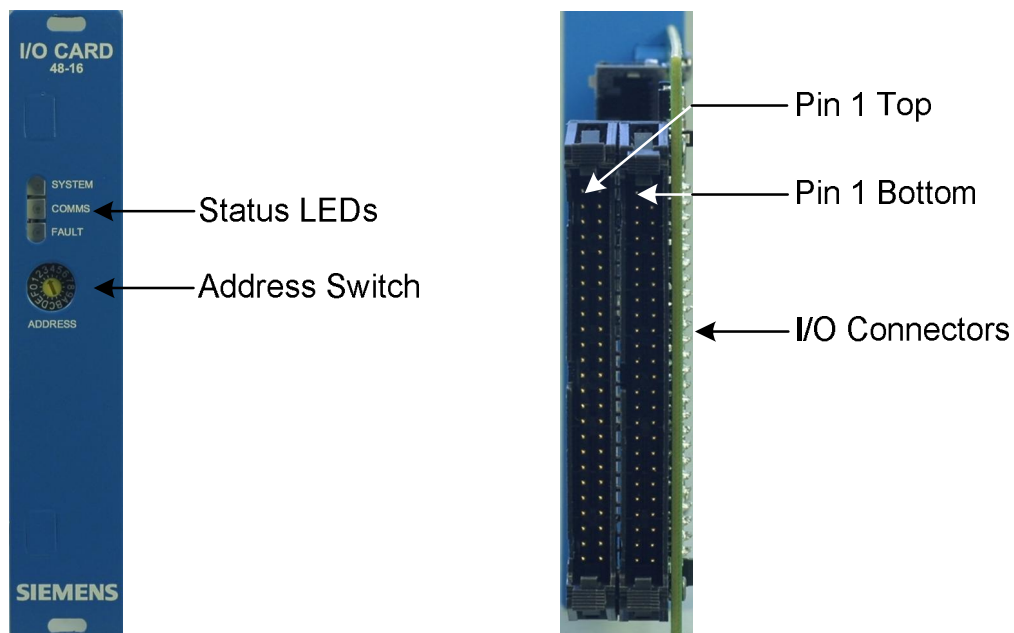


Figure 10 – I/O Board Front/Rear Connections

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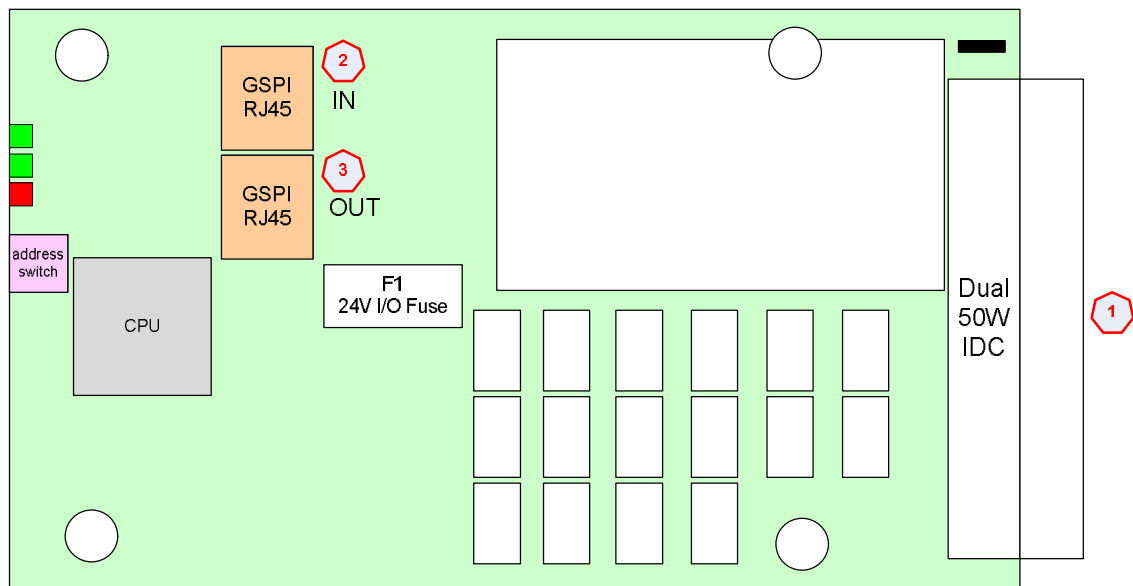


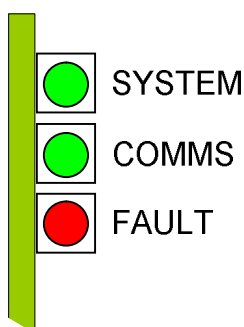
Figure 11 – I/O Board Layout

ID	Description	Connector
1	I/O Connections – see Table 20 for pinout	Double 50Way IDC
2	GSPI Bus – In	RJ45
3	GSPI Bus – Out	RJ45

Table 17 – I/O Board Connector Functions and Types

4.8.1 I/O LEDs

The three LEDs on the front of the I/O Board as shown below (viewed from the front).



LED	State	Description
SYSTEM / RUN (Green)	Slow Flash	Normal Operation.
	Medium Flash	Configuration or Firmware Download in progress.
	Double Pulse	Low power mode (Future Feature)
COMMS (Green)	On	Normal operation, GSPI messages being received regularly.
	Off	No relevant GSPI messages received in the last second (implies loss of communications), or low power mode.
FAULT (Red)	Off	Normal operation.
	On	Fault detected see fault section for details of possible faults.
	Double Pulse	Firmware is in Error and low power mode.

Table 18 – PSU & I/O Board LED States

4.8.2 I/O Faults

Presence of the following I/O board faults will cause the fault LED to be on. When the fault LED is illuminated the fault table webpage can be accessed to determine which of the following faults is present.

Fault	Possible cause/Remedy
Hardware error	Could be caused by one of the following <ul style="list-style-type: none"> 1. I/O fuse (F1) failure <ul style="list-style-type: none"> - replace the fuse (section 7.3.5) 2. PSU board hardware failure <ul style="list-style-type: none"> - replace the PSU board
Supply voltage low (environment error)	The PSU board supply voltage has dropped below 8V.

Fault	Possible cause/Remedy
Unrecognised hardware	Unable to interface with the EEPROM device on startup. Hardware error. - replace the PSU board.
Software error (includes – Checksum failure, Watchdog Failure, S/W general error, Initialisation failure)	Unlikely to occur. If observed report to Poole Engineering (see section 1.2) - Power cycle the Gemini3 unit if possible – to attempt to remove the fault.
GSPI Address Changed	The board address has changed, but the new address will not take effect until the next board reset. All board addresses should be set as desired and then the whole system power cycled.

Table 19 – I/O board fault troubleshooting

4.8.3 Connector Pinouts



The I/O card pinout is the same as that on the Gemini² Bus/MOVA I/O board allowing for direct replacement.

When making custom I/O looms remember that the connector shell is actually 54 ways with the two end positions unused as shown below. (To allow the connector to be retained by the latching arms).

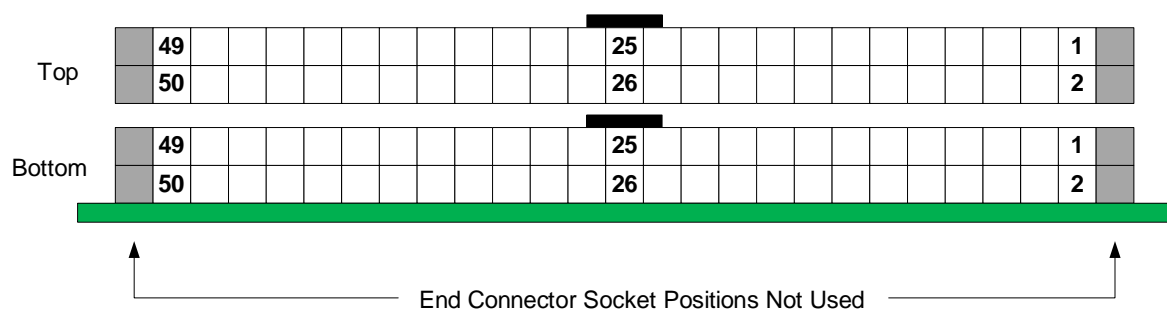
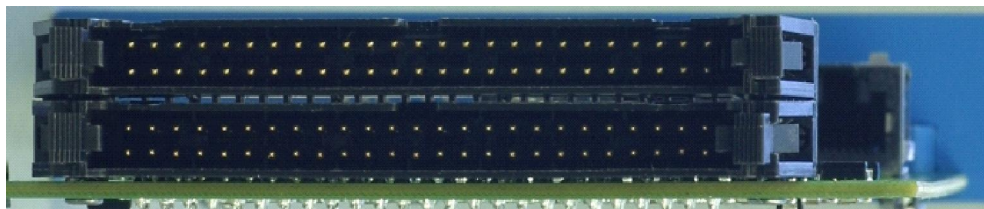


Figure 12 – I/O Board Connector Pinout

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Connector & Pin	Function	Card/Port	Bit ID	Connector & Pin	Function	Card/Port	Bit ID	Loom Colours 667/1/26585/005
Bottom 1	Input 1	gspiX.in.0	1	Top 1	Input 25	gspiX.in.3	1	Blue
Bottom 2	Input 2		2	Top 2	Input 26		2	Yellow
Bottom 3	Input 3		3	Top 3	Input 27		3	Brown
Bottom 4	Input 4		4	Top 4	Input 28		4	Violet
Bottom 5	Input 5		5	Top 5	Input 29		5	Orange
Bottom 6	Input 6		6	Top 6	Input 30		6	Grey
Bottom 7	Input 7		7	Top 7	Input 31		7	Pink
Bottom 8	Input 8		8	Top 8	Input 32		8	Red/Blue
Bottom 9	Input 9	gspiX.in.1	1	Top 9	Input 33	gspiX.in.4	1	Red/Green
Bottom 10	Input 10		2	Top 10	Input 34		2	Red/White
Bottom 11	Input 11		3	Top 11	Input 35		3	Red/Brown
Bottom 12	Input 12		4	Top 12	Input 36		4	Red/Orange
Bottom 13	Input 13		5	Top 13	Input 37		5	Red/Grey
Bottom 14	Input 14		6	Top 14	Input 38		6	Blue/Green
Bottom 15	Input 15		7	Top 15	Input 39		7	Blue/White
Bottom 16	Input 16		8	Top 16	Input 40		8	Blue/Brown
Bottom 17	Input 17	gspiX.in.2	1	Top 17	Input 41	gspiX.in.5	1	Blue/Orange
Bottom 18	Input 18		2	Top 18	Input 42		2	Blue/Grey
Bottom 19	Input 19		3	Top 19	Input 43		3	Green/Orange
Bottom 20	Input 20		4	Top 20	Input 44		4	Green/Brown
Bottom 21	Input 21		5	Top 21	Input 45		5	Green/Grey
Bottom 22	Input 22		6	Top 22	Input 46		6	Brown/Grey
Bottom 23	Input 23		7	Top 23	Input 47		7	Orange/Brown
Bottom 24	Input 24		8	Top 24	Input 48		8	Orange/Grey
Bottom 25	0V	-	-	Top 25	0V	-	-	White
Bottom 26	0V	-	-	Top 26	0V	-	-	White
Bottom 27	N.O. O/P 1	gspiX.out.6	1	Top 27	N.O. O/P 9	gspiX.out.7	1	Blue
Bottom 28	N.C. O/P 1		1	Top 28	N.C. O/P 9		1	Yellow
Bottom 29	Com O/P 1		1	Top 29	Com O/P 9		1	Brown
Bottom 30	N.O. O/P 2		2	Top 30	N.O. O/P 10		2	Violet
Bottom 31	N.C. O/P 2		2	Top 31	N.C. O/P 10		2	Orange
Bottom 32	Com O/P 2		2	Top 32	Com O/P 10		2	Grey
Bottom 33	N.O. O/P 3		3	Top 33	N.O. O/P 11		3	Pink
Bottom 34	N.C. O/P 3		3	Top 34	N.C. O/P 11		3	Red/Blue
Bottom 35	Com O/P 3		3	Top 35	Com O/P 11		3	Red/Green
Bottom 36	N.O. O/P 4		4	Top 36	N.O. O/P 12		4	Red/White
Bottom 37	N.C. O/P 4		4	Top 37	N.C. O/P 12		4	Red/Brown
Bottom 38	Com O/P 4		4	Top 38	Com O/P 12		4	Red/Orange
Bottom 39	N.O. O/P 5		5	Top 39	N.O. O/P 13		5	Red/Grey
Bottom 40	N.C. O/P 5		5	Top 40	N.C. O/P 13		5	Blue/Green
Bottom 41	Com O/P 5		5	Top 41	Com O/P 13		5	Blue/White
Bottom 42	N.O. O/P 6		6	Top 42	N.O. O/P 14		6	Blue/Brown
Bottom 43	N.C. O/P 6		6	Top 43	N.C. O/P 14		6	Blue/Orange
Bottom 44	Com O/P 6		6	Top 44	Com O/P 14		6	Blue/Grey
Bottom 45	N.O. O/P 7		7	Top 45	N.O. O/P 15		7	Green/Orange
Bottom 46	N.C. O/P 7		7	Top 46	N.C. O/P 15		7	Green/Brown
Bottom 47	Com O/P 7		7	Top 47	Com O/P 15		7	Green/Grey
Bottom 48	N.O. O/P 8		8	Top 48	N.O. O/P 16		8	Brown/Grey
Bottom 49	N.C. O/P 8		8	Top 49	N.C. O/P 16		8	Orange/Brown
Bottom 50	Com O/P 8		8	Top 50	Com O/P 16		8	Orange/Grey

Table 20 – I/O Connector Pinout

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Note: **X** denotes gspi card number (the same as card address).

4.8.4 Changing Fuses

See section 7.3.5 for fuse change procedure.

4.8.5 I/O Board Rotary Address Switch

This screwdriver-adjustable switch is located on the I/O board(s) as shown in Figure 10 and is set up for the board address (before the Stratos Outstation is powered up) in accordance with the appropriate Works Specification. The valid address range is 1 through 15 (where A to F denote 10 to 15 respectively). Address 0 is the default address switch position for spare boards.



The address range is shared with other GSPI peripheral boards and must be unique. The Stratos Outstation PSU board is fixed at address 15 (so this address must not be used).

4.8.6 Replacing the I/O Board

Should an I/O board need to be replaced, see section 7.3.1 for details.

4.8.7 I/O Board Kits & Assembly

The Stratos outstation supports a number I/O board options as listed below:

Description	Part Number
48-16 I/O Board Kit with cable I/O card, RJ45 cable, BUS/MOVA Cables (x2), Spacers & Fixings	667/1/50076/000
48-16 I/O Board Kit without cable I/O card, RJ45 cable, Spacers & Fixings	667/1/50076/002
I/O PCB Kit TC12 Adaptor I/O card, RJ45 Cable, TC12 card & IDC interlinking cables, Spacers & Fixings	667/1/50076/001

I/O boards are mounted using the provided spacers adjacent to the CPU board. The GSPI RJ45 cable must be connected from the CPU board to the I/O board 'IN' connector. Any subsequent I/O boards are mounted on the stack in the same manner and the GSPI RJ45 cable then runs from the previous I/O board 'OUT' connector to the next I/O board 'IN' connector. The I/O cable assemblies shown in Figure 13 should be tidily cable tied to the surrounding metalwork to reduce the strain on the connectors.

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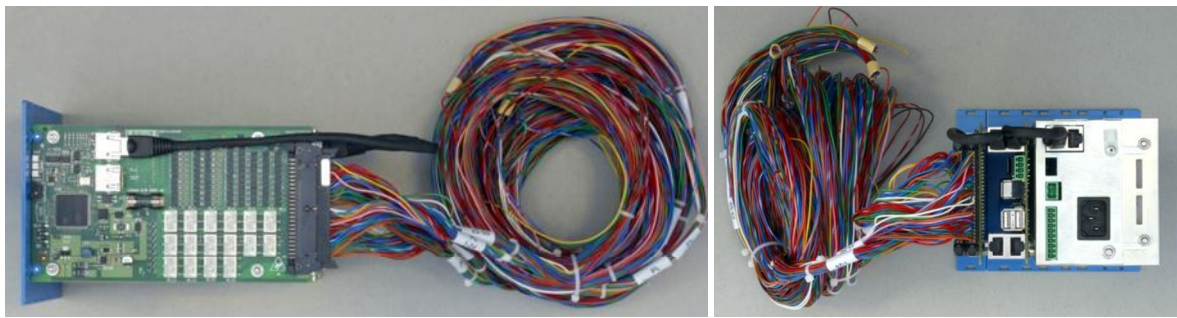


Figure 13 – I/O Wiring

4.8.8 TC12 Adaptor Board

This board allows the reuse of the TC12 to controller UTC interface cabling. It has been developed to reduce the installation time of Stratos Outstations where a TC12 OTU is being replaced.

This is of particular benefit where a 3rd party controller is involved or there is no enhanced serial link.

To Gain the Maximum advantage it is essential that a few basic rules are followed:

- The Bit pattern of the Gemini must be the same as that of the TC12.
- The TC12 word cables should be treated carefully and not disconnected from the controller.



If the TC12 is also used for the controllers lamp monitoring do not use this solution, unless the Customer is prepared to loose the lamp monitoring facility.

If a TC12 interface is required, the TC12 Adaptor board should be mounted in the same manner as an I/O board as shown in Figure 14. It should always be the last board in the stack and connected to the adjacent I/O board using the two 50way IDC ribbon cable assemblies provided.

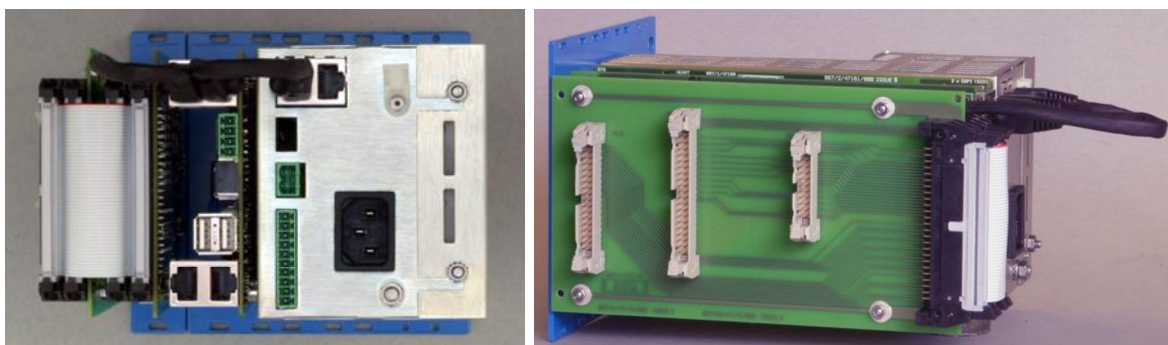


Figure 14 – TC12 Adaptor Fitted

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4.9 The Intelligent Detector Backplane

The Stratos Outstation can be connected to intelligent detector backplane(s) for better integration with detectors. Each IDB can be used with up to four loop detectors and provides a GSPI interface which removes the need to wire discrete detector outputs into I/O board inputs and provides a mechanism for terminating the street loop wiring for 16 loops for each backplane fitted. Each IDB must be addressed in the same manner as any GSPI I/O board as described in Section 4.8.5.

The Intelligent Detector Backplane Kit part number is 667/1/32910/950.

Whenever detectors are used a separate detector supply kit will be required unless there is spare capacity on a detector supply that is already available within the cabinet. Four detector supply kits are available as shown below:

Description	Part Number
ST900ELV Detector Supply Kit – 2A (-24V Rectified AC, ELV Compliant)	667/1/33075/000
ST900ELV Detector Supply Kit – 6A (-24V Rectified AC, ELV Compliant)	667/1/33074/000
ST800/ST900 Detector Supply Transformer – 2A (24V AC)	667/1/27853/000
ST800/ST900 Detector Supply Transformer – 6A (24V AC)	667/1/20292/008

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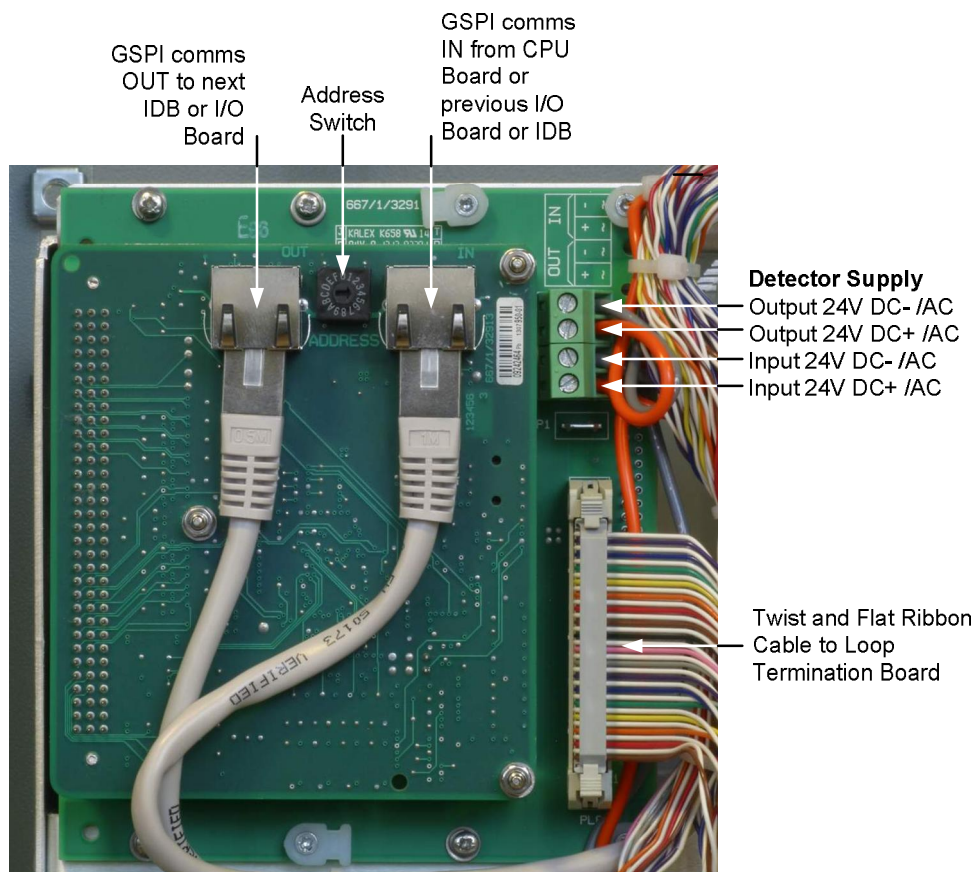


Figure 15 – Intelligent Detector Backplane Wiring

When defining a system it is important to consider the number of single detectors, IDBs and Stratos outstation along with rack size to determine the build format. Table 22 below will help in the design phase to define the physical rack space required.

The function IO mapping for the IDB is shown in Table 21. When configuring the IO mapping in the outstation this table should be consulted.

Detector	Function	Card/ Port	Bit ID
1	Loop 1 Detect	GspiX.in.0	1
	Loop 2 Detect		2
	Loop 3 Detect		3
	Loop 4 Detect		4
2	Loop 1 Detect		5
	Loop 2 Detect		6
	Loop 3 Detect		7
	Loop 4 Detect		8
3	Loop 1 Detect	GspiX.in.1	1
	Loop 2 Detect		2
	Loop 3 Detect		3
	Loop 4 Detect		4

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Detector	Function	Card/ Port	Bit ID
4	Loop 1 Detect		5
	Loop 2 Detect		6
	Loop 3 Detect		7
	Loop 4 Detect		8
-	Not Used	GspiX.in.2	1-8
1	Detector Reset	GspiX.out.3	1
2	Detector Reset		2
3	Detector Reset		3
4	Detector Reset		4
-	Not Used		5-8

Table 21 – IDB IO Mapping

Note: X denotes gspi card number (the same as card address).

4.10 Single Detector Backplane

Loop detectors can be connected using the single detector backplane 667/1/17205/000. The channel outputs on this backplane need to be wired to the TR2523 inputs on the IO or PSU boards. The backplane pinout is shown in Figure 16.

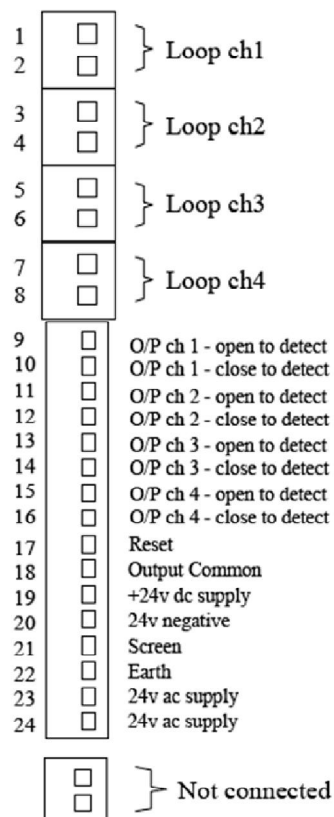


Figure 16 – Single Detector Backplane Wiring

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4.11 Racks

The Stratos Outstation can also be ordered in either an 11" or 19" 3U rack and optionally an associated 2U tray where other equipment such as detectors and routers can be mounted. For information on routers and mounting refer to the IP router installation guide (667/CI/45025/000)

Table 22 below gives an indication of the space requirements for typical equipment to be mounted in the 3U racks. The numbers displayed are the maximum that can be fitted into an 11" or 19" rack.

11" Rack Combinations				
Stratos Outstation	1	1	1	1
48-16 I/O Board	0	1	2	3
IDB	0	0	0	0
Single Detector	2	2	2	1
19" Rack Combinations				
Stratos Outstation	1	1	1	1
48-16 I/O Board	0	1	2	3
IDB	2	2	2	2
Single Detector	2	1	0	0
TC12 adaptor is the same width as a 48-16 I/O board				

Table 22 – Rack Population Guide

If the unit is a standalone configuration in an 11" or 19" rack, detector blanking panel kits are available to fill unused rack space. These are available in three widths as shown in Table 23. These three combinations allow all unused rack space to be covered. The standard top level assemblies are fitted with the required blanking panels.

Description	Part Number
Single Detector Blanking Kit – Fills a single detector slot	667/2/31615/000
I/O Blanking Plate Kit – Same width as an I/O Board front panel	667/2/50071/000
Wide Detector Blanking Kit – 168mm wide panel	667/2/50072/000

Table 23 – Rack Blanking Plates

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5 INSTALLATION AND COMMISSIONING

This section describes in detail how to install and commission Stratos Outstation installations.

For a summarised process see Appendix C.



Mains voltages may still be present within the unit even if it has been isolated if the unit has been connected to other sources of mains voltages for the purpose of monitoring those voltages (e.g. Lamp Supply). Care should be taken to ensure all sources of mains voltages are isolated before working on the equipment.

5.1 Pre-Requisites

This section details pre-requisites required before undertaking any tasks on the Stratos Outstation.

5.1.1 Documentation

Anyone undertaking installation, commissioning and first line maintenance on the Stratos Outstation will also need the User Interface Handbook (667/HU/46000/000) which provides details of how to connect to the unit and the different user interfaces which are available.

Please also refer to the various handbooks and quick start guides available as shown in section 1.3.

5.1.2 Qualifications

Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical/electronic equipment, are to be allowed to use and/or work on the equipment. All work shall be performed in accordance with the Electricity at Work Regulations 1989 or the relevant local, state and government regulations.

Any personnel working on a Stratos Outstation should hold the relevant National Highways Sector Scheme modules.

Training requirements for non UK users may be different.

5.1.3 Tools

In addition to a standard Engineer's tool kit, the following tools are required when carrying out any work on a Stratos Outstation:

User Interface

The user can communicate with the unit in a number of ways:

- Ethernet to a Laptop or PC. Interface uses a standard web browser
- WiFi using the approved USB WiFi Dongle. Interface uses a standard web browser on a WiFi enabled device such as a laptop or smart phone
- USB. Interface uses either a standard web browser or SSH terminal session
- RS232 Handset using the USB to RS232 Handset Adaptor Cable

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One of the following is required depending on the user interface chosen to be used during the installation.

Description	Part Number
USB cable – 1m (A to B)	999/4/44255/000
Netbook kit (Requires USB cable 999/4/44255/000 if connecting via USB)	667/1/32380/000
Serial handset Techterm (Requires USB to RS232 Handset Adaptor Cable 667/1/47180/000)	667/4/13296/001
Old Oyster handset (Requires USB to RS232 Handset Adaptor Cable 667/1/47180/000)	667/4/13296/000
Larger Screened Oyster handset (Requires USB to RS232 Handset Adaptor Cable 667/1/47180/000)	667/4/13296/002
USB to RS232 Handset adaptor cable (for handheld RS232 terminal)	667/1/47180/000
USB WiFi Dongle (Can be used with WiFi laptop or smart phone)	667/1/45966/001

Cabinet Access

If the outstation is mounted in a Siemens Traffic Controller, one or more of the following will be required to gain access to the controller cabinet.

Description	Part Number
T-bar key	667/2/20234/000
S-18 key – Main Cabinet *	4/MC 289

* - In some areas customers specified keys may be used.

License Installation

If licensed features are required, and licences need to be transferred onto the Stratos Outstation then the following extra equipment is required:

Description	Part Number
USB Licence Card Reader	667/1/45964/001

For information on how to install licenses please refer to the procedure described in section 11 of the ST950 and Stratos Outstation User Interface Handbook 667/HU/46000/000.

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5.2 Preparation

Before attending site to Install a Stratos Outstation check that you have the following pre-requisites:

- Installation tools as described above in section 5.1.3.
- Ensure that the Outstation is the correct variant of the product.
- Ensure you have the correct licenses for the application pre-installed, or on a Card.
- Any required Communication equipment (will be site specific).
- Communication network configuration information (Site Specific).
- OTU Supply Kit – (667/1/27121/000) (In case there are no spare fused supplies).
- Printed SAT Sheet for completion on site (667/CI/31601/002).
- Printed OTU/MOVA Set Up Form for completion on site (667/CI/31601/000).
- Handbooks etc. As described in section 1.3.

5.3 Assembly

Additional board kits should be fitted according to section 7.3.1.

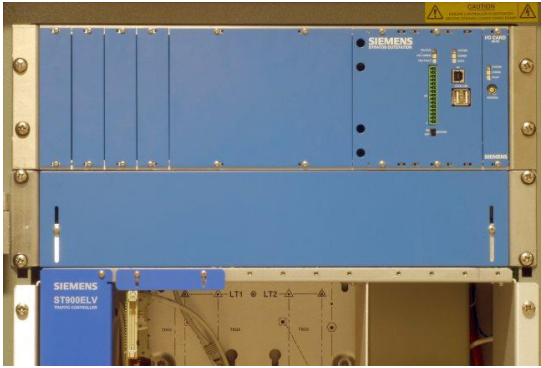



The Stratos Outstation comes as standard with the following parts:

Part Description	Part Number
Lamp Supply Monitor Cable	667/1/47177/000
IEC 90 degree Mains Lead	702/4/08537/000
Zip Tie for mains lead	915/4/97087/026
Fixing Kit (M6 screws, caged nuts, washers, M2.5 screws & washers)	667/1/47182/000
Ethernet Cable – 1m	998/4/88323/000
Modem Power Connector	531/4/03187/172
Outstation to Controller standard serial cable	667/1/47176/100

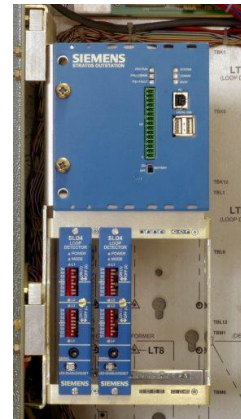
5.4 Mounting the Stratos Outstation

The Stratos Outstation can be mounted in a number of ways depending on the configuration required. The unit should be mounted as low as possible in the controller cabinet to reduce operating temperatures and maximise battery life.

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Mounting Option	Photo
Supplied in an 11" or 19" 3U rack assembly with additional front panels and optional 2U equipment tray.	
Supplied with no rack to mount to an existing 3U rack e.g. a 11" or 19" standard detector rack Can be mounted in any position, but ideally mounted on the left allows for easy I/O expansion	
6U 19" ST900ELV/ST950ELV Rack	
11" or 19" Swing Frame Mounted directly to swing frame Using the caged nut locations	

T400s cabinet mini swing frame – new style
(Stratos outstation front panel will be vertical
as if it were mounted in a 19" rack)
667/1/33770/000 *



* Some earlier swing frame assemblies mount the Gemini with the front panel horizontal.



If the internal backup battery is fitted the Stratos Outstation can be mounted in any orientation apart from front panel facing down.

5.5 Power Supply Connection

Ensure a suitable separate protected supply (fuse or breaker) is available and suitably rated. The unit consumes 60W maximum. In Siemens controllers use the 6A MCB Kit 667/1/27121/000.

The mains supply is connected via a standard IEC C13 mains lead. To maintain a low profile and to allow the cable to be retained, a 90° lead is supplied which can be secured to the rear of the unit with the supplied cable tie. See Figure 17. Under no circumstances plug the unit into the controllers' maintenance socket.

If a separate earth connection is required use the earth cable 667/1/27079/073 with the rear earth stud.



Figure 17 – Stratos Outstation Mains Lead

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The other boards in the system are powered over the RJ45 GSPI cables.



It is important that only supplied RJ45 cables are used as the cable must carry all of the supply current. (Certain cheaper RJ45 cables are known to have very thin conductors which will cause a problem if used on a Stratos Outstation).

5.6 Controller Serial Connection

The Stratos Outstation can be connected to the TR 2523 port of a traffic controller using the correct RS232 interface cable and baud rate as shown in the tables below:

Supplier	Controller	RS232 Baud Rate	RS232 Cables (see Table 25)
Siemens	ST950	19200	Standard
	ST800	19200	Standard
	ST900	19200	Standard
	ST750	19200	Standard
	ST700	19200	Standard
	T400	1200	Standard
	T500	1200	Standard
Microsense / Telent	MPC	1200	Standard + Extension
	MTC	1200	Standard + Extension
	Sentinel	1200	Standard
	Optima	1200	Loopback
Peek	TSC3	1200 (19200*)	Loopback
	TRX	9600 (19200*)	Loopback
	PTC-1	9600 (19200*)	Loopback
	TSP	1200 (19200*)	Loopback
Motus	TM150	115200	Loopback
	TM150 2P	115200	Loopback

* This baud rate can be set by the BDR handset command.

Table 24 – Controller RS232 Baud Rates and Cable Variants

RS232 Cable	Description	Part Number
Standard	This is a 1.6 metre cable for controllers which drive hardware flow control signals DTR & RTS. The cable terminates in 25-way D-type plug. This cable is supplied as standard with the outstation.	667/1/47176/100

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Loopback	This is a 1.6 metre cable with loopback between pins 4, 5 and 20 (RTS, CST & DTR signals) for controllers which do not drive hardware flow control signals. This cable must be ordered separately.	667/1/47176/101
Extension	This is a 1 metre straight-through extension cable with 25-way D-type plug on one end and 25-way D-type socket on the other. It is used to extend the standard or loopback cables, e.g. where the Microsense MTC & MPC have the handset port on the manual panel. This cable must be ordered separately.	667/1/26579/002

Table 25 – Controller RS232 Cable Part Numbers

The cable is plugged into connector ID 5 on the CPU board as shown in Figure 5.

5.7 I/O and Detector connections

The I/O will need to be wired to the correct I/O pins on either the I/O board(s) [48 inputs + 16 outputs] or the PSU board [8 inputs + 2 outputs] for the system to perform the required functions. For the 48-16 I/O board refer to Table 20 and for the PSU board I/O refer to Table 11 for connector pinouts. (The PSU board is at fixed address 15 so the 8 + 2 I/O is mapped at the 'end' of the I/O space.

If MOVA is used, refer to the defined I/O mapping to determine where the detector I/O needs to be wired to. Refer to the MOVA handbook 667/HB/46000/003.

If UTMC OTU functionality is required, the configuration CSV file as exported from the installation should be consulted to determine where the individual force and reply bits need to be wired to. Refer to the UTMC handbook 667/HB/46000/004.

5.8 IP Communications

If IP communications are to be used, the correct system IP address must be programmed into the Stratos Outstation before connecting it to the network to ensure that no IP conflicts occur and that the unit is on the correct subnet.

In order to support the last gasp dial functionality the comms device must be powered from a backup supply. If using the Stratos outstation to provide the backup the comms devices power supply must be wired to the Modem Power connector pins 2 & 3 as shown in the table below. Refer to section 3.4 for more detail.

The maximum load permissible on the switched modem supply output is 1A.

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Modem Power
Pin 1

Pin	Function
1	+24V DC input – Power for CPU board when no PSU board is used
2	0V
3	Switched 24V (Nominal) Modem supply output *
4	Optional RTC supply input

Table 26 – 4 Way 3.81mm pitch – Modem power and DC Power



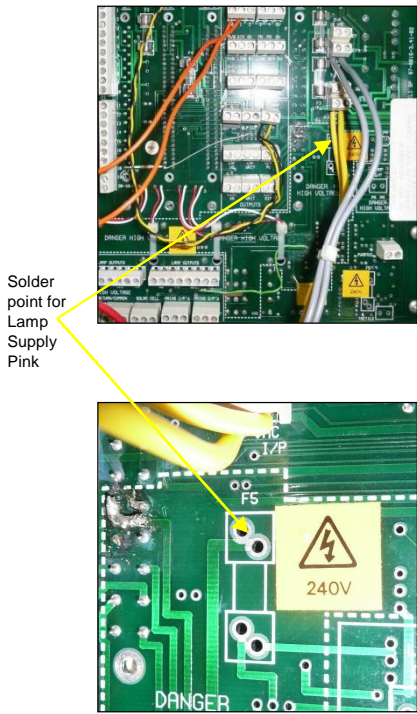
* Note that the modem supply will follow the battery backup supply during a mains failure. This output can range from 8 – 28V DC.

5.9 Lamp Supply

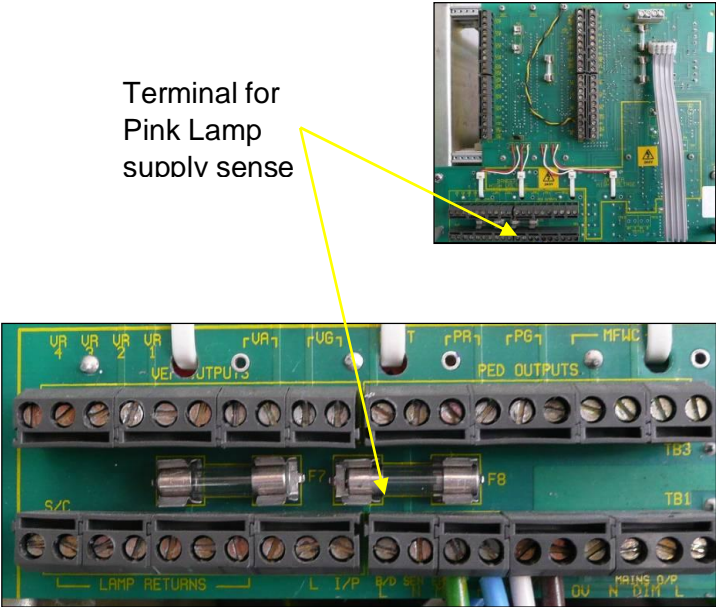
The supplied lamp supply cable assembly 667/1/47177/000 should be wired to a suitable position within the controller. For Siemens controllers the following lamp supply pickup positions are available. The Controller lamp supply connector mating half will be required as shown in the table below.

Controller Type	Lamp Supply Wiring Location		Controller Connector Part Number
ST700 ST750	Phase Driver: L / PSU N	SK2 pin 6 SK2 pin 7, SK1 pins 1-7	No Connector required Connector already present
ST800 ST900 ST950	MDU: L N N	PL2 8z, 6d PL2 20z, 24z, 28z PL2 22d, 26d, 30d	Use ¼" spade crimps Neutral may need to come from controller back panel
ST750ELV	Backplane: -48V 0V	PL12 Pin 4 PL12 Pin 3	Use Dedicated Kit 667/1/47178/000

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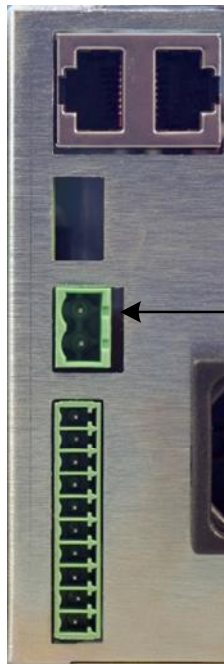
Controller Type	Lamp Supply Wiring Location	Controller Connector Part Number
ST900ELV ST950ELV	HPU: -48V PL8 Pin 2 (Marked -) 0V PL8 Pin 1 (Marked +)	531/4/03187/000
Siemens T500	The pink wire can be connected to TBB2 on the MPM (Main Processor Module) and the black to TBB1	none
Siemens T400	Connect to the lamp supply "Hedgehog" using a spade connector	Use ¼" spade crimps
Microsense MPC Pelican Variant	 <p>Solder point for Lamp Supply Pink</p>	<p>This requires this connection for the pink wire to be soldered directly onto the backplane.</p> <p>The black wire can be attached to any of the Lamp Return Neutrals.</p> <p><i>Note: There is another similar backplane that uses ribbon connections instead of terminals (for Midi Cabinets), this has the same solder point available for Lamp supply connection.</i></p>

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Controller Type	Lamp Supply Wiring Location	Controller Connector Part Number
Microsense MPC Midi Case/ Puffin Variant	 <p>Terminal for Pink Lamp supply sense</p>	The Pink Wire can be connected to the "B/D L" terminal on the controller backplane, with the black attached to one of the "Lamp Returns" to the left.
Microsense MTC	OMU Lamp Supply (At the back of the cabinet to the right of the MDU, amongst the LV terminations)	none
Microsense Sentinel	Dim/ Bright Sense is available at the back of the controller cabinet in the LV Terminations section.	none
Telent Optima	Dim/ Bright Sense is available at the back of the controller cabinet in the LV Terminations section.	none
Peek TLC2	<p>The Bright/Dim supply is available at "Lamp1" and "Lamp2" terminals on the inner left hand side termination panel.</p> <p>Neutral is available at the regulatory sign neutral on the lower terminal strip at the base of the cabinet.</p>	none
Peek TSC3	The Bright/Dim supply is available at "Phase1", "Phase2" and "N" terminals underneath the main cabinet isolator.	none
Peek TSP	Lamp supply voltage available on single pin connector adjacent to C63	Peek TSP Mod Kit 81-669
Peek TRX	LSM Module Pin 2 can be used for the Lamp supply Reference	
Peek PTC-1	The Bright/Dim supply is available at "LVS1" or "LVS2", only one of these lamp supplies can be monitored so it's recommended to monitor the 240V Supply on a multi supply installation.	

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The information below shows the wiring for the lamp supply monitor input connector:



Lamp
Supply
Pin 1

Pin	Function
1	230V Mains Live supply (LV) or -48V (ELV) Pink Wire
2	Return (Neutral for LV, 0V for ELV) Yellow Wire

5.10 Powering

Before powering the unit for the first time, ensure that the mains supply is correctly protected and wired. Switch the unit on and check that the appropriate LEDs illuminate on the PSU and CPU boards.

If the Stratos Outstation is equipped with an internal backup battery, ensure that it is enabled by setting the front panel 'BATTERY' switch to the 'ON' position.

5.11 Installing Additional Licenses

The Stratos Outstation comes with a UTMC OTU license as standard. If additional licenses are required they can be installed by following the procedure described in section 11 of the ST950 and Stratos Outstation User Interface Handbook 667/HU/46000/000 for the web interface.

5.12 Configuration

To configure the UTMC OTU I/O Mapping, import the "CSV" file for the junction, modify as necessary and save. The process is detailed in the UTMC OTU Handbook 667/HB/46000/003.

When both MOVA and UTMC OTU are configured on the Stratos Outstation, they share the same force and reply bits on the interface to the controller, with the addition of MOVA-specific I/O (for detectors, take-over and controller-ready). MOVA can also be configured without UTC, using the MOVA-Only setup facility on the I/O mapping screen. If UTC is to be added at some later date, then it is better, if possible, to configure the site for both UTC

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and MOVA based on the CSV file exported from the UTC instation. Refer to the MOVA 7 Handbook 667/HB/46000/003 for details.

5.13 Observing LEDs

CPU Card

LED	State	Description
System (Green)	Slow flash	Normal operation.
	Medium flash	Normal operation, Fault present.
	Very fast flash	Restricted mode*
COMMS Communications (Green)	On	Under UTC control, pulses off indicate receipt of messages.
	Off	Not under UTC control, pulses on indicate receipt of messages.
BUSY (Red)	Off	Normally off.
	Flashing	Flashes to indicate the system is busy performing an operation that must not be interrupted, for example start up, upgrade, USB “memory stick” style interface is busy. Do not remove USB device or switch off the outstation while this LED is flashing.
Ethernet Connectivity (2x green inboard)	On / Flashing	Indicate activity for the two Ethernet interfaces. Top and Bottom.
Modem Power (inboard)	On	Indicates that the Modem Power is on.
	Off	Indicates that the Modem Power is off.

* Restricted mode is similar to safe mode on a PC where the user can access the unit to examine logs, diagnose problems and perform firmware updates.

Table 27 – CPU Board LED States

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I/O & PSU Card

LED	State	Description
SYS / RUN System / Run (Green)	Slow Flash	Normal Operation.
	Medium Flash	Configuration or Firmware Download in progress.
	Double Pulse	Low power mode.
COMMS Communications (Green)	On	Normal operation, GSPI messages being received regularly.
	Off	No relevant GSPI messages received in the last second (implies loss of communications), or low power mode.
FLT – Fault (Red)	Off	Normal operation.
	On	Fault detected. Refer to Table 10 and Table 19 for details of possible faults.
	Double Pulse	Firmware is in Error and low power mode.

Table 28 – PSU & I/O Board LED States

5.14 Testing, Validation and Site Acceptance

The installation should be tested in accordance to the relevant section for the feature(s) used.

Run the system test scenario.

Site Acceptance Test (SAT) sheet (667/CI/31601/002) should be followed and completed to ensure that the installation has been completed to a good standard, and that the outstation is running properly.

The Relevant Setup Form (dependant on feature(s) used) should be completed and left in the controller cabinet.

Eg. Stratos Outstation UTM Commissioning Data 667/CI/52250/000

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6 SELF TEST

The Stratos Outstation self test functions are present to aid fault finding and are accessed through the *Tester* web page on the top navigation pane. Results for tests are displayed against each test with totals available at the top of the web page for ease of analysis.



To be able to run test scenarios the Tester application must first be run from the *System* web page by clicking on the Run button alongside TesterApp.

Tests are split into test scenarios which are selected from the drop-down menu at the top of the page. The following scenarios are available:

- Stratos Outstation System Test
- Stratos Outstation CPU PCB Test
- Stratos Outstation USB Test
- Stratos Outstation Modem Port (PL8) Test
- Stratos Outstation Aux Port (PL2) Test
- All Tests

When test(s) are run a test progress bar is displayed below the totals data. If any test fails the bar is displayed in Red, otherwise it will be displayed in Green.

For each test scenario, the set of tests is displayed in the table and the user has the option to run tests individually or as a set. Tests can be run once or continuously by selecting the *Loop* tickbox. A log is available for each test which shows in more detail the test functions and pass/fail state for the last run.

Note. Some test need specific connections or loopback adaptors to pass and therefore may report test failures if these are not available.

The system test scenario should be used as part of the on-site testing and validation process. Table 29 shows the tests included in the system test scenario.

LED	Description	Expected result during normal installation
Mass Storage	Checks for a mass storage device and whether it can be accessed	Pass
Licence Reader	Checks the on board licence card reader	Pass
Licence Card	Checks the licence card in the on board reader	Pass
Licence Inventory	Reads and logs the installed licences	Pass
System Version	Checks that the system version data can be accessed	Pass
RTC	Checks that the RTC hardware operates correctly	Pass

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LED	Description	Expected result during normal installation
Lamp Supply Voltage Test (LV)	Check the Lamp Supply Voltage is within tolerance (LV)	Only pass if connected lamp supply is ~230V AC
Mains Clock Test	Check the Mains Clock count rate	Pass
Support Battery Test	Check the Support Battery is connected and available	Pass
GSPI IO	Reads and logs the GSPI IO card Inventory	Only pass if PSU and one IO Card connected

Table 29 – System Self Test Scenario

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7 MAINTENANCE

Before attempting any maintenance work the following must be performed:

1. Ensure the unit is powered off and isolated from the mains.
2. Ensure the battery isolation switch on the front panel is switched to 'OFF'.
3. Remove all connectors that interface with external equipment (as some of these may have mains potential voltages present on them).



If multiple I/O boards are fitted make a note of the board address against the plugged in loom before removing along with the position of each connector (top & bottom position).

4. Remove the unit from its mounted position.

7.2 Regular Maintenance

Units only require annual maintenance, which can be performed at the same time as the inspection of other equipment on site. On these visits, trained personnel must switch off the mains power to the controller and the unit.

Regular Maintenance Activity	Frequency
General inspections of the unit in situ for any contamination, overheating of components, corrosion or battery leakage. Rectify where necessary.	Annual
Check the tightness of all interface and earth cables and re-tighten where necessary.	Annual
Check the condition of the interface cables; making sure there is no chafing of the insulation and that the general condition of the insulation is good. Replace any damaged or worn cables.	Annual
Check the mechanical tightness of the main securing screws of the unit and retighten where necessary.	Annual
Replace battery as indicated by the battery test which is automatically performed approximately every 30 days.	As required

7.3 First Line

Replacement of the following components is considered first line maintenance. Maintenance work beyond the first line should be referred to Siemens. Part numbers and spares are listed in the Appendix.

Authorised agents may replace the following:

- CPU Card (section 7.3.1)
- IO Card (section 7.3.3)
- Battery (section 7.3.4)
- Fuses (section 7.3.5)
- Cables and wiring

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7.3.1 Replacing the CPU Board

1. If any I/O boards are fitted these will need to be removed to gain access to the CPU board. Refer to later in this section for removal procedure.
2. Unscrew the four short pillars (or long + short mounting pillars if an I/O board was fitted) shown in Figure 18 below.
3. Lift the **back** of the board clear of the rear mounting studs and slide the board back to clear the front connectors from the front panel then lift the board vertically off the front studs as shown in Figure 19 below.
4. Be careful not to invert the unit as the four loose spacers that were under the CPU board will slide off.
5. To fit the new board, place the mounting front slots over the front pillars with the rear of the board raised above the rear mounting pillars.
6. Slide the board forward to engage the connectors into the front panel holes and then drop the rear of the board onto the rear mounting pillars.
7. Refit the four short pillars.
8. Refit the four long pillars if an I/O board is fitted.
9. Refit the I/O board(s) if applicable following the I/O board replacement procedure below.
10. Transfer the Heart (SD card) and License card from the old CPU board to the new CPU board with reference to sections 4.4.2 and 4.4.3.

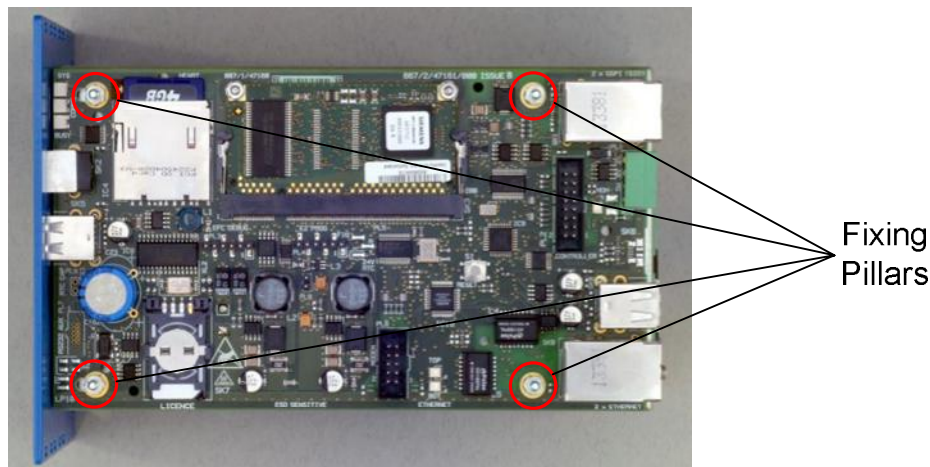


Figure 18 – CPU Board Fixings

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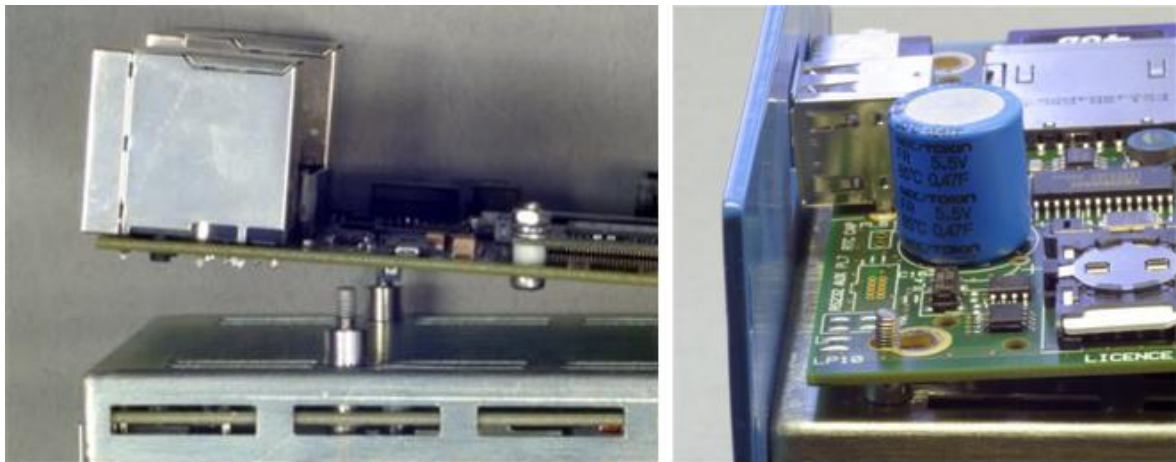


Figure 19 – CPU Removal

7.3.2 Replacing the PSU Board

The PSU board is not considered to be a field replaceable part as the unit needs to be fully disassembled to replace it. If the PSU board is thought to be faulty, return the complete unit for repair.

7.3.3 Replacing the 48-16 I/O Board

To remove the I/O board follow the following procedure:

1. Remove the RJ45 cable(s).
2. Remove the four nuts and spring washers shown in Figure 20 below.
3. Pull the board vertically off the mounting studs.
4. Replace the board using the reverse procedure ensuring that each I/O board address is set correctly and that the correct wiring loom is plugged back into the correct position on the correct board.
5. Reconnect the RJ45 cable(s) ensuring that they are plugged into the correct connector (IN & OUT).

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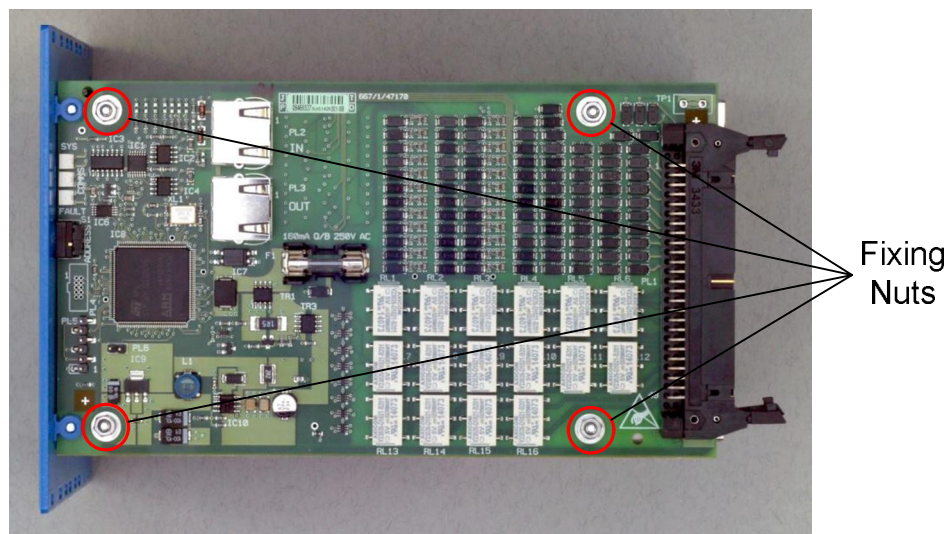


Figure 20 – I/O Board Fixings

7.3.4 Replacing the Internal Backup Battery

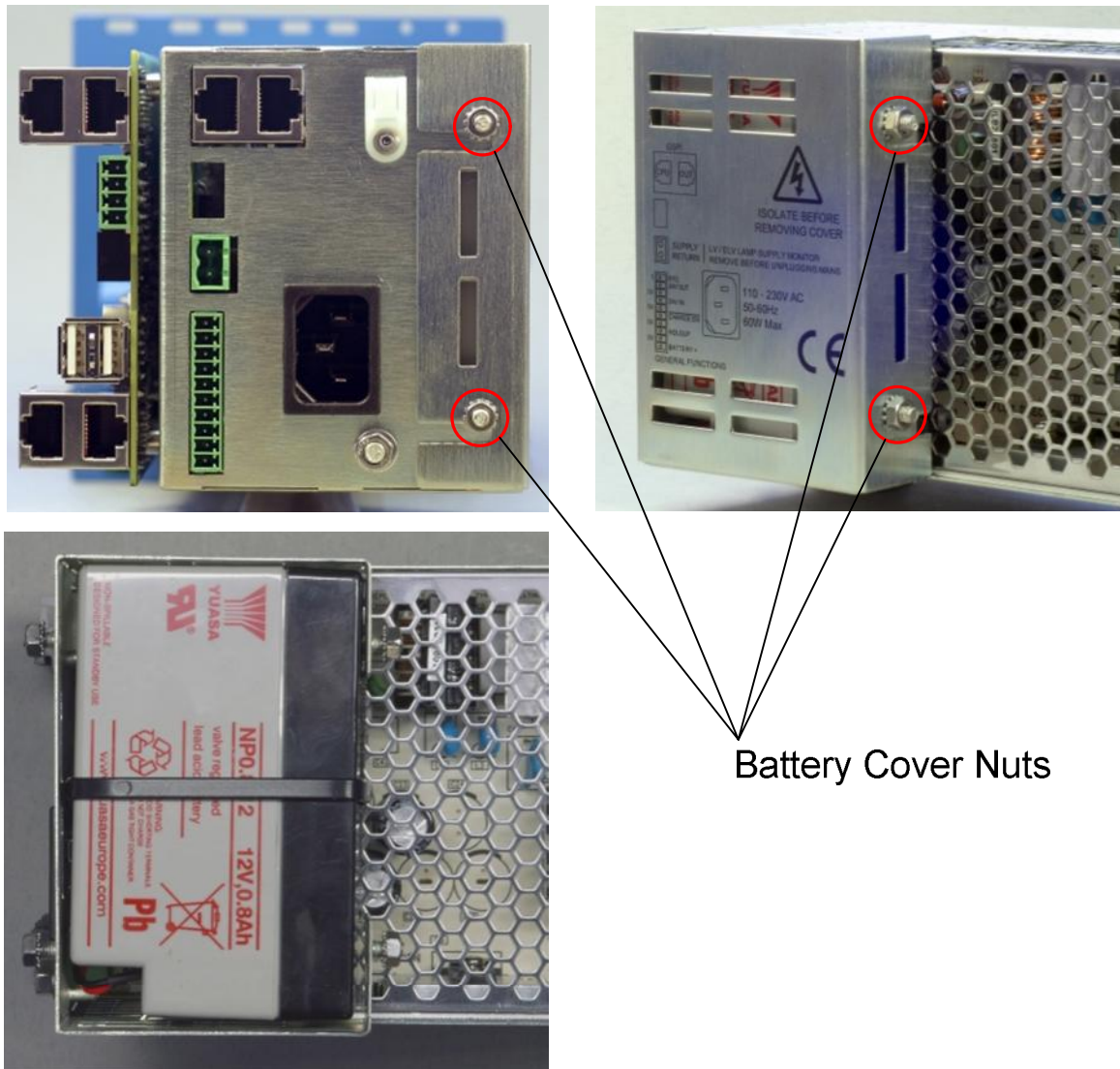


Risk of explosion if battery is replaced by an incorrect type.

The following procedure should be followed to change the internal backup battery:

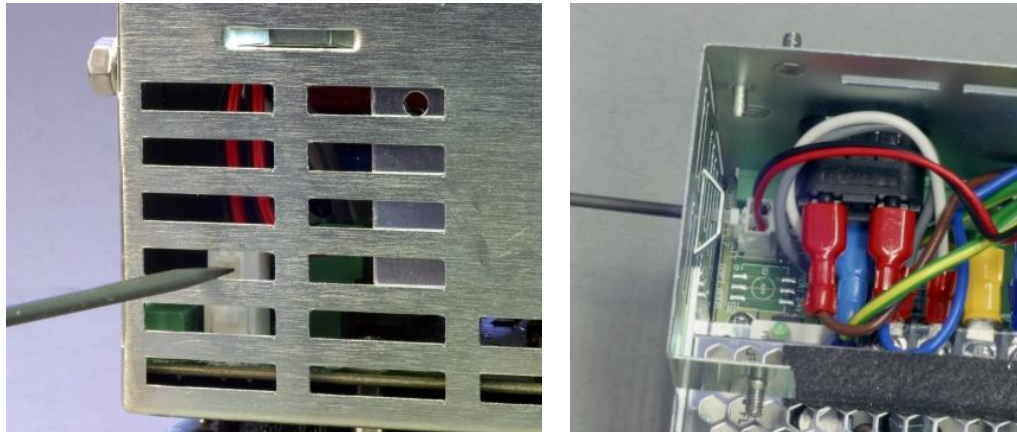
1. Isolate the battery with the 'BATTERY' isolation switch on the front panel.
2. Power off the unit and disconnect the mains supply and lamp supply monitor connector.
3. Loosen the four battery cover nuts as identified in the photo below and remove the battery cover.

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4. Remove the battery carefully and place on top of the power supply (as it will still be plugged into the board).
5. Use a small screwdriver to depress the top of the battery retention clip through the vent slot as shown in the photos below and pull **gently** on the battery cable to release the connector.

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6. Dispose of old battery through an approved battery re-cycling centre.
7. Connect new battery ensuring the latching clip is engaged.
8. Place battery in correct orientation into the enclosure.
9. Replace battery cover and tighten nuts.
10. Reconnect the supply, enable the battery with the battery isolation switch.

7.3.5 Replacing Fuses

The system contains two fuses that are located on the PSU board. To replace either of these follow this procedure:



When replacing a fuse it is important to fit the correct type and rating for continued protection of the Stratos Outstation and users equipment.

Before changing any fuses ensure that the unit is disconnected from the AC mains supply and that the battery is isolated using the front panel switch S1.

PSU Board Fuse:

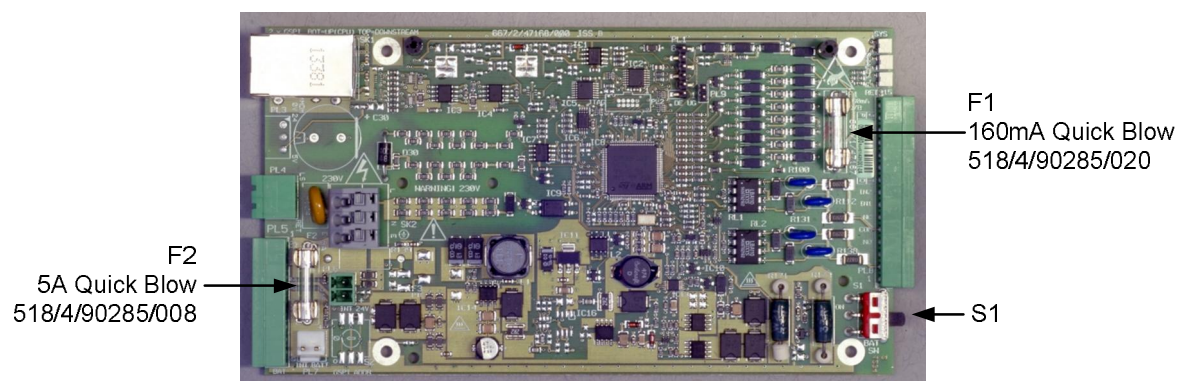


Figure 21 – Power Supply Board

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F1 – 24V I/O Fuse or

F2 – Battery Fuse

1. In addition to the Mains Supply, unplug the following cables as they may be connected to powered external equipment:
 - a. LV/ELV Lamp supply.
 - b. I/O cable from the PSU board.
2. Remove the battery as described in section 7.3.4.
3. Remove the AC/DC power supply retaining screws from the base of the unit and rotate the power supply module to reveal the fuses. If F2 needs to be replaced the IEC inlet connector will have to be removed. Disconnect the ¼" spade crimps from the back of the inlet and depress the retaining tabs [two on the top and one on the bottom] to release the connector – Refer to Figure 23.
4. The relevant fuse can now be replaced – refer to Figure 21.
5. Re-assemble unit.

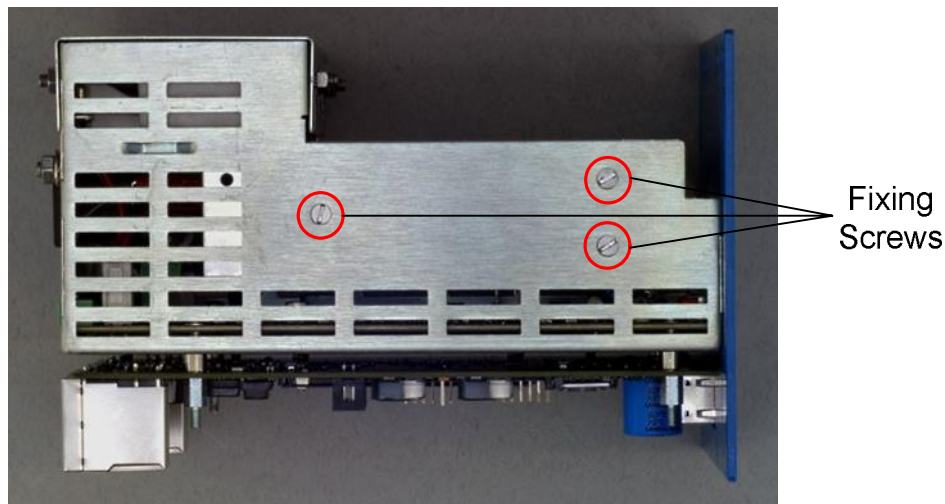


Figure 22 – Power Supply Module Fixings

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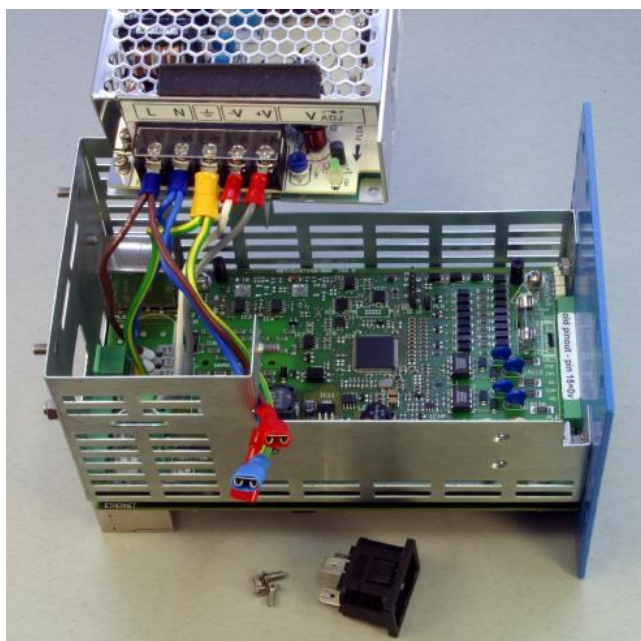
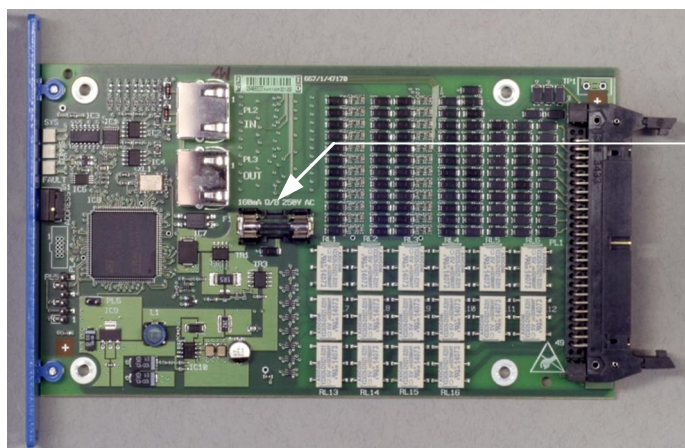


Figure 23 – Access to Fuses on PSU Board

48-16 I/O Board Fuse:

Each 48-16 I/O board also contains a 24V I/O fuse as shown in Figure 24.

Before replacing ensure that the system is switched off and isolated from the mains supply. Also ensure that the I/O connections for the I/O card in question have been removed as these are connected to other equipment that may still be powered.



F1
160mA Quick Blow
518/4/90285/020

Figure 24 – 48-16 I/O Board

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Appendix A Technical Specification

Inbuilt modes of operation

- MOVA (Implements MOVA 7) (Licensed option)
- UTMIC OTU (Licensed option)

Communications

- Two 10/100 Ethernet interfaces
- Four USB host ports
- One USB device port (USB Handset)
- One RS232 Auxiliary port
- One RS232 TR2523 port

Inputs and outputs

- Switchable 24V / 1A protected modem power output [CPU Board]
- External DC power supply input [PSU board]
- External battery backup input [PSU board]
- LV or ELV lamp supply monitor input [PSU board]
- All I/O compliant to TR2523
- Digital inputs: 8, Isolated changeover relay outputs: 2 [PSU board]
- Digital inputs: 48, Isolated changeover relay outputs: 16 [Each 48-16 I/O board]
- Maximum number of I/O cards: 3
- Maximum number of inputs: 152
- Maximum number of isolated digital outputs: 50

Other facilities

- Timing sources: Internal Crystal, NTP network time server
- Licensed options use encrypted Smart Card
- Web based user interface
- USB Handset port or optional adaptor for RS232 25 Way D Connector

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Parameter	Range
Power Supply	Either: 90-264VAC – 120,230V Nominal, 50/60Hz $\pm 4\%$
Transients	To BS EN50293:2001
Power Consumption: Base Unit 48-16 I/O Card Maximum Configuration	7W Nominal 4W Nominal Worst case with interfaces fully loaded: 60W
Power break support times without internal battery	50ms minimum (only when PSU card used)
Battery support time – Internal battery	Minimum 1 minute – software controlled
Size Basic with GSPI cables With one I/O card & GSPI cables	120mm (W) x 130mm (H) x 250mm (L approx) 145mm (W) x 130mm (H) x 250mm (L approx)
Weight Basic With one I/O board	1.6 Kg 1.8 Kg
Operating Temperature Range	-34°C to +65°C with internal battery -34°C to +74°C with external battery
Operating Humidity Range	Up to 95% non-condensing
Material / Finish	Mild steel Zinc plated chassis Powder coated aluminium front panels
Approvals	Designed to meet the relevant sections of: <ul style="list-style-type: none"> • EN50293 Electromagnetic compatibility. Road traffic signal systems • EN50556 Road traffic signal systems • TR2522A Remote Monitoring and Control of Traffic Control Equipment via a Telecommunications Network • TR2523 – Traffic Control Equipment Interfacing Specification • CE Approved • RoHS Compliant

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Battery Directive 2006/66/EC

The Stratos Outstation may be shipped with a sealed lead acid battery for backup purposes. The battery is shipped with the battery isolation switch open. The battery is to be recycled in an appropriate manner.



Elexon Codes

The Elexon Charge Codes that apply to Stratos Outstation can be found in the Siemens document 667/RE/29050/000.

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Appendix B Part Numbers and Spares List



Use of components other than those listed, or modifications or enhancements that have not been authorised by Siemens Traffic may invalidate the warranty and/or safety of this product.

Part Numbers

Listed below are all the currently available main parts and spares for the Stratos Outstation. Detail can be found on the Stratos Outstation Family Tree Drawing 667/DZ/52250/ETC.

Main parts

Description	Part Number
Stratos Outstation – Free Standing (No Rack)	667/1/52250/004
Stratos Outstation – Free Standing (11" Rack, No Modem Tray)	667/1/52250/311
Stratos Outstation – Free Standing (19" Rack, No Modem Tray)	667/1/52250/319
Stratos Outstation – Free Standing (11" Rack with 2U Modem Tray)	667/1/52250/511
Stratos Outstation – Free Standing (19" Rack with 2U Modem Tray)	667/1/52250/519
Stratos Outstation – TC12 I/F (No Rack)	667/1/52250/104
Stratos Outstation – TC12 I/F (11" Rack with 2U Modem Tray)	667/1/52250/611
Stratos Outstation – TC12 I/F (19" Rack with 2U Modem Tray)	667/1/52250/619
Stratos Outstation – Semi Integral (No Rack)	667/1/52250/014
Stratos Outstation – Semi Integral (11" Rack with 2U Modem Tray)	667/1/52250/711
Stratos Outstation – Semi Integral (19" Rack with 2U Modem Tray)	667/1/52250/719
48-16 I/O Board Kit with cable I/O card, RJ45 cable, BUS/MOVA Cables (2), Spacers & Fixings	667/1/50076/000
48-16 I/O Board Kit without cable I/O card, RJ45 cable, Spacers & Fixings	667/1/50076/002
I/O PCB Kit TC12 Adaptor I/O card, RJ45 Cable, TC12 card & IDC interlinking cables, Spacers & Fixings	667/1/50076/001
Intelligent Detector Backplane Kit	667/1/32910/950
Siemens ELV Detector Supply Kit – 2A (-24V Rectified AC, ELV Compliant)	667/1/33075/000
Siemens ELV Detector Supply Kit – 6A (-24V Rectified AC, ELV Compliant)	667/1/33074/000
Detector Supply Transformer – 2A (24V AC)	667/1/27853/000
Detector Supply Transformer – 6A (24V AC)	667/1/20292/008
CPU I/O Cable Assembly (8 Input + 2 Output connector and loom – 3m)	667/1/30607/000
License Card Kit – Lightweight Tunnel	667/1/47560/000
License Card Kit – MOVA 7 Streams 1,2	667/1/47562/000
License Card Kit – MOVA 7 Streams 3,4	667/1/47563/000

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Description	Part Number
License Card Kit – UTMIC OTU	667/1/47568/000
Lightning Protection Kit – Ethernet	667/1/45972/001
Lamp Supply Monitor Cable Assembly (3m)	667/1/47177/000
ST750ELV Lamp Supply Monitor Kit (3m)	667/1/47178/000
Stratos Outstation to Siemens Traffic Controller Serial Cable	667/1/47176/100
Stratos Outstation to Peak TLC3, C3000, Microsense Controller Serial Cable	667/1/47176/101
OTU Rack Backplane Wiring Kit (4 wires)	667/1/31612/000

Spares

Description	Part Number
Stratos Outstation CPU Board	667/1/47160/001
Stratos Outstation 48-16 I/O Board (With front panel)	667/1/50075/000
Stratos Outstation TC12 Adaptor Board	667/1/47175/000
I/O Board to TC12 Board 50Way IDC Cable – Long	667/1/31626/100
I/O Board to TC12 Board 50Way IDC Cable – Short	667/1/31626/101
PSU board Internal battery fuse – 20mm 5A Quick Blow	518/4/90285/008
CPU & I/O board 24V I/O Fuse – 20mm 160mA Quick Blow	518/4/90285/020
Stratos Outstation Battery with Tie	667/1/47183/000
RJ45 Cable – Short – 160mm (CPU to PSU)	998/4/88405/016
RJ45 Cable – Long – 320mm (CPU or I/O Card to I/O Card)	998/4/88405/032
IEC 90 degree mains lead 3.5m	702/4/08537/000
CPU board 4 way 3.81mm pitch modem power connector mating half	531/4/03187/172
PSU board 2 way 5.08mm pitch lamp supply monitor connector mating half	531/4/03769/000
PSU board 10 way 3.5mm pitch general functions connector mating half	531/4/03702/010
I/O BUS/MOVA Cable Assembly 2.5m (No terminal blocks) Single loom	667/1/26585/005
Single Detector Blanking Plate kit (fills a single detector slot)	667/2/31615/000
I/O Blanking Plate kit (Same width as an I/O board front panel)	667/2/50071/000
Wide Detector Blanking Plate kit (168mm wide)	667/2/50072/000

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Appendix C Installation & Commissioning Guide

The following guide provides a step-by-step guide to installing and commissioning a Stratos Outstation system and can be used as a checklist.

1. Locate a suitable installation location within the target system, ideally this should be as low as possible in the controller cabinet to reduce operating temperatures and maximise battery life.
2. Switch off and isolate the target system AC mains supply.
3. Install the Stratos Outstation using suitable hardware (screws etc).
4. Identify a suitable AC mains supply point within the target system. (This should be a dedicated fused supply)
5. Route the supply mains lead between the supply point and the Stratos Outstation unit and secure in place using cable ties.
6. Wire the mains supply lead into the AC supply feed identified.
7. Secure the mains lead to the back of the Stratos Outstation unit with a cable tie to the tie point provided.
8. For lamp supply monitoring, identify the lamp supply point within the target system and using suitable cable, wire the lamp supply to the Stratos Outstation lamp supply connector. Ensure that for ELV lamp supplies that the polarity is correct before plugging into the Stratos Outstation. Refer to Table 12.
9. If external battery backup is being employed, ensure that the battery polarity is correct before plugging into the general function connector on the Stratos Outstation. Refer to Table 13.
10. Connect other interfaces using suitable cables as required ensuring the cable looms are secured using cable ties as appropriate.
11. If the internal battery backup battery is fitted, enable the backup function via the front panel switch.
12. Power up the unit.
13. Configure and test as required:
 - a. Current Date / Time & Time zone: *System – Settings – System Date & Time*
 - b. Comms parameters: *System – Settings – Comms*
 - c. Check required licences are available: *System – Licence System – Manager*
 - d. Check that the Device Inventory is as expected (The required boards can be found by the CPU board): *System – Status – Inventory – Devices*
 - e. Run the system test scenario (see Table 29) and check that results are as expected: *Tester*
 - f. Carry out configuration of facilities as required (e.g. UTMC OTU, MOVA – see related documents for details)

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g. Check the *Fault Table* for faults & Notifications before leaving site


14. Complete the Stratos Outstation UTM Commissioning data (667/CI/52250/000) leaving the form in the controller cabinet for future reference.
15. Complete the Stratos Outstation SAT Sheet for customer sign off (667/CI/52250/002)

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Appendix D Stratos Outstation Basic Unit General Assembly

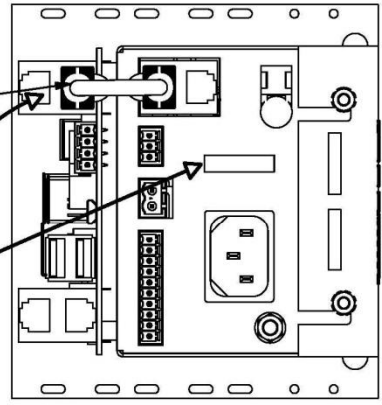
DRAWING NUMBER
667/GA/50070/000

SHT
1 OF 1

 DO NOT SCALE! IF IN DOUBT ASK!

NOTES:
1. +ve = Grey, -ve = White.
2. Route wires for PSU loom (item 40) as shown in photo (Img 1).
3. Ensure that the battery wires are not trapped between the battery and top of the PSU when installing the battery.


REAR VIEW (Fig 1)



SEE STEP 22


SERIAL No. LABEL POSITION

Img 2.



34

Img 1.



NO LOCTITE ON REAR TWO SCREWS (ITEM 21). SEE STEP 5.

SEE STEP 16

40

10

3

SEE STEP 21

13

Tightening Torque: 0.9Nm

33

32

28

29

1

4

23

24

Tightening Torque: 0.9Nm

12

27

11

31

SEE STEP 19

20

20

2

25

Tightening Torque: 2.2Nm

3

26

22

BATTERY ISOLATOR SWITCH

APPLY LOCTITE. SEE STEP 11

21

4

4

25

Tightening Torque: 0.9Nm

PSU WIRING TABLE

COLOUR	PSU	IEC	PSU PCB	BATT
BROWN	LIVE	LIVE	LIVE	
BLUE	NEUTRAL	NEUTRAL	NEUTRAL	
GRN/YEL	EARTH	EARTH	EARTH	
WHITE	24V OUT (-)		INT 24V (-)	
GREY	24V OUT (+)		INT 24V (+)	
RED			INT BATT (+)	(+)
BLACK			INT BATT (-)	(-)

ASSEMBLY INSTRUCTIONS:

1. Fit cable tie base (item 32) to back of enclosure in orientation shown using rivet (item 33).

2. Insert PSU loom (item 40) live, earth, and neutral wires into wago connector on the PSU board. See (Fig.3).

3. Push PSU loom 24v plug into its socket on the PSU board.

4. Insert PSU board (item 11) into enclosure (item 1).

5. Fit washers (item 21 & 22) to M3x20 screws. Apply loctite 222 to the front 2 screws (item 21) as shown in (Fig.2). Tighten screws as shown. Ensure the two rear screws are tight against the board (this is an earth connection).

6. Place M3 x 5 spacers (item 23) onto protruding screws on the outside of the enclosure.

7. Lower CPU board (item 12) onto protruding screws so it sits onto the spacers.

8. Retain with M3 x 8 M/F spacers (item 24). Ensure screws on PSU board are still tight.

9. Fit front panel (item 2) & retain with M4 nuts (item 20) (x2) and tighten to 2.2Nm.

10. If provided, remove plastic wiring cover on PSU and loosen screws.

11. Insert PSU (item 10) into enclosure and retain with 3no. M3 x 6mm CSK screws (item 25), apply loctite 222.

12. Insert fork connectors on the PSU wiring loom into PSU terminals as per wiring table (see Img.1 for routing) and tighten to 0.9Nm.

13. Replace wiring cover on PSU.

14. Feed spade connectors through IEC aperture and connect to IEC plug (item 57) (see Fig 4).

15. Clip IEC plug (item 57) into aperture in enclosure. In orientation shown.

16. Cable tie battery lead to battery with (item 34) as shown in Img 2. Cut off excess cable tie flush.

17. Ensure battery isolation switch is in the off position.

18. Using a suitable tool insert battery connector into its socket on the PSU board. Take care to avoid battery short circuit.

19. Fit foam strip (item 31) to the inside of the battery cover and to the top of the PSU where the battery touches it.

20. Loosely install 4 no. M4 nuts (item 20) to studs on the outside of the battery enclosure.

21. Fit battery (fits only one way), fit battery cover (item 3) and secure with nuts (item 20). Ensure correct orientation.

22. Install short link GSPi cable (item 55) as shown in (Fig.1).

23. Fit serial number label on rear of enclosure in position shown & items 27, 28 & 29.

2

29/09/2014

TS007700

KMW

1

25/06/2014

TS007575

KMW

A

23/04/2014

TS007421

KMW

REV

DATE

RFC No.

APPD

SIEMENS

PLC

Mobility Division, Traffic Solutions

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TOLERANCES UNLESS OTHERWISE STATED
0 = ±0.5
0.0 = ±0.2
0.00 = ±0.05
Ang. Tol. = ±0.5
ALL DIMENSIONS IN mm

THIS DRAWING HAS AN INVENTOR COMPUTER MASTER

PROJECT
STRATOS OUTSTATION

FINISH

TITLE
STRATOS OUTSTATION BASIC UNIT
GENERAL ASSEMBLY

MATERIAL

DRN
NRA

CHKD
KMW

APPD
KMW

SCALE
NTS

A3

SHT
1 OF 1

DRAWING NUMBER
667/GA/50070/000

Fig 4

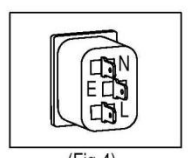


Fig 3

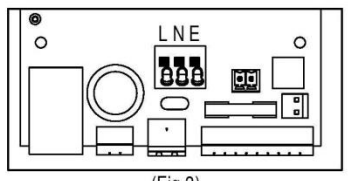
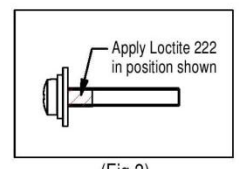
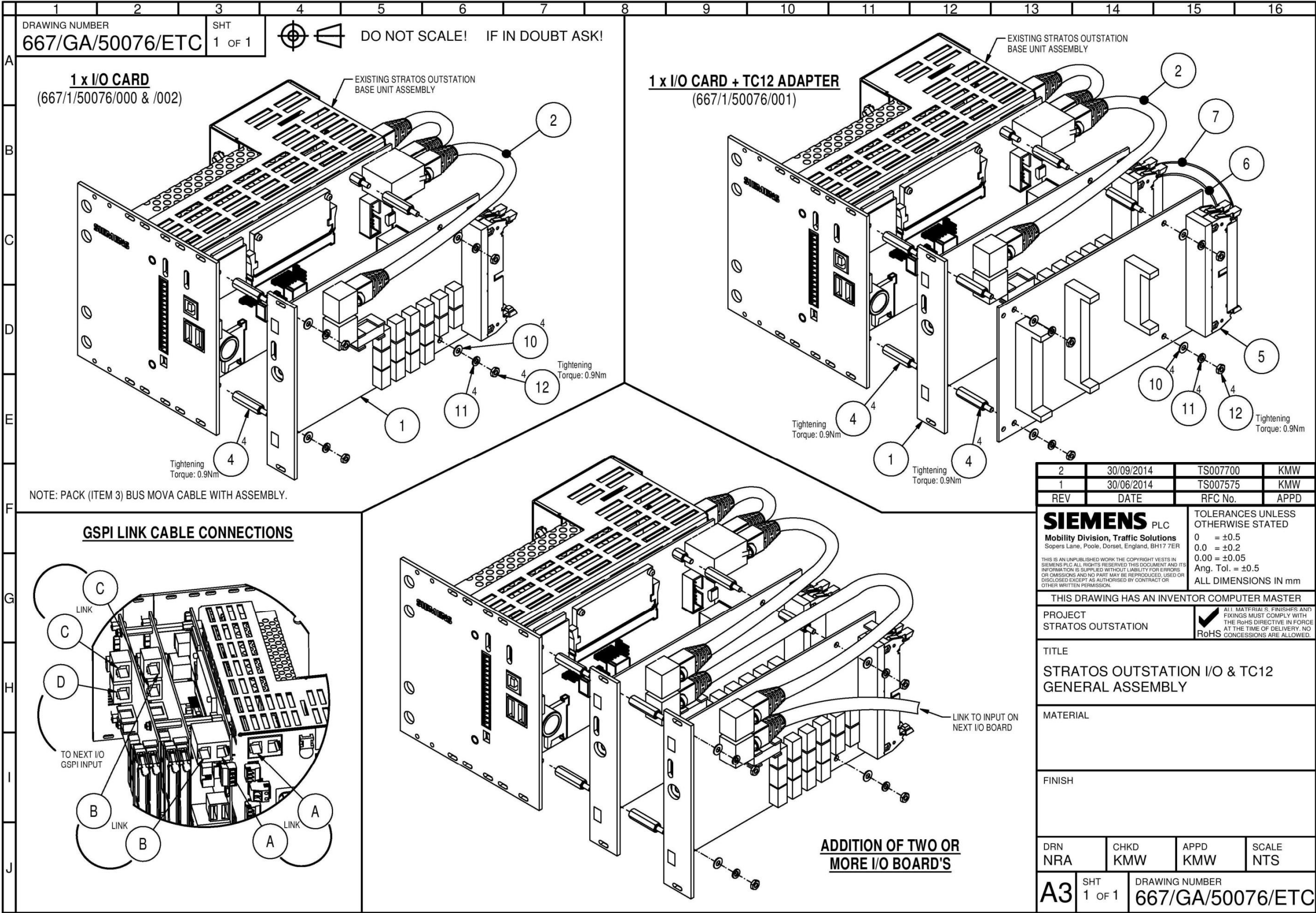


Fig 2



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Appendix E Stratos Outstation I/O & TC12 Adaptor General Assembly



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DRAWING NUMBER: 667/GA/52250/ETC SHT 1 OF 3

DO NOT SCALE! IF IN DOUBT ASK!

FOR SEMI INTEGRAL SEE NOTE 4

FOR SEMI INTEGRAL SEE NOTE 4

11" RACK FRONT VIEW

NOTE - ONLY 3 NO. DETECTOR BLANKING PANELS FITTED

19" RACK FRONT VIEW SHOWING INTELLIGENT DETECTOR BACKPLANE FITTED

SEE NOTE 3.

SEE NOTE 1.

PART OF 667/31614-001

3 (11") or 4 (19")

19" RACK FRONT VIEW

POSITIONS SEE NOTE 1.

1 811.1 621.3

2 811.1 621.3

10 811.1 621.3

8 811.1 621.3

SIEMENS

SCREWS, NUTS & WASHER SCHEDULE

SCREWS, NUTS & WASHER SCHEDULE	
SCREWS TO BS 3382 OR BS 4183	
NUTS TO BS 3382	
WASHERS TO BS 4320-A OR BS 1760	
621.3	M2.5 x 10 PAN HD STST
811.1	M2.5 WASHER PLAIN STST

NOTES

- FOR POSITIONS 1, 2 & 3 FIT DETECTORS AND DETECTOR BACKPLANES AS DEFINED IN THE WORKS ORDER. DISPOSE OF BLANKING PLATES ITEMS 8 AS REQUIRED.
- FOR WIRING INFORMATION SEE SHEET 2.
- FOR 11" VERSION ITEM 10 IS NOT FITTED.
- FOR SEMI INTEGRAL VERSIONS FIT ITEM 9 SHORT BLANKING PANEL IN THE I/O CARD POSITION.
- A COPY OF 667/DB/31610/ETC IS TO BE DESPATCHED WITH THE UNIT.

REVISIONS

REV	DATE	BY	CHKD	APPD	DESCRIPTION
4	09/12/2014				TS007763 KMW
3	15/10/2014				TS007736 KMW
2	30/09/2014				TS007709 KMW
1	04/07/2014				TS007575 KMW

TOLERANCES UNLESS OTHERWISE STATED

0.0 = ±0.5

0.0 = ±0.2

0.00 = ±0.05

Ang. Tol. = ±0.5

ALL DIMENSIONS IN mm

THIS DRAWING HAS AN INVENTOR COMPUTER MASTER

PROJECT: STRATOS OUTSTATION

TITLE: STRATOS OUTSTATION RACK ASSEMBLY

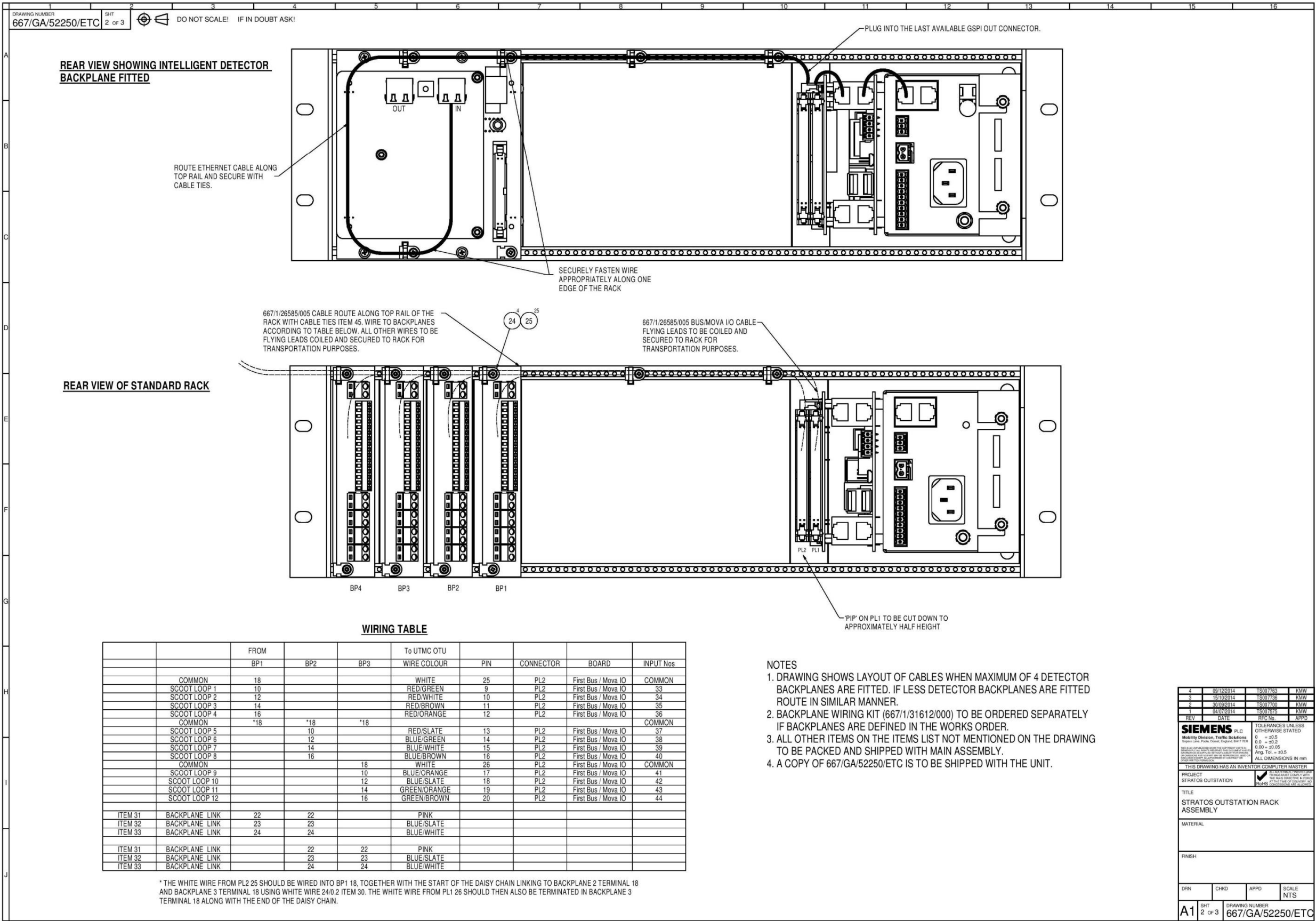
MATERIAL:

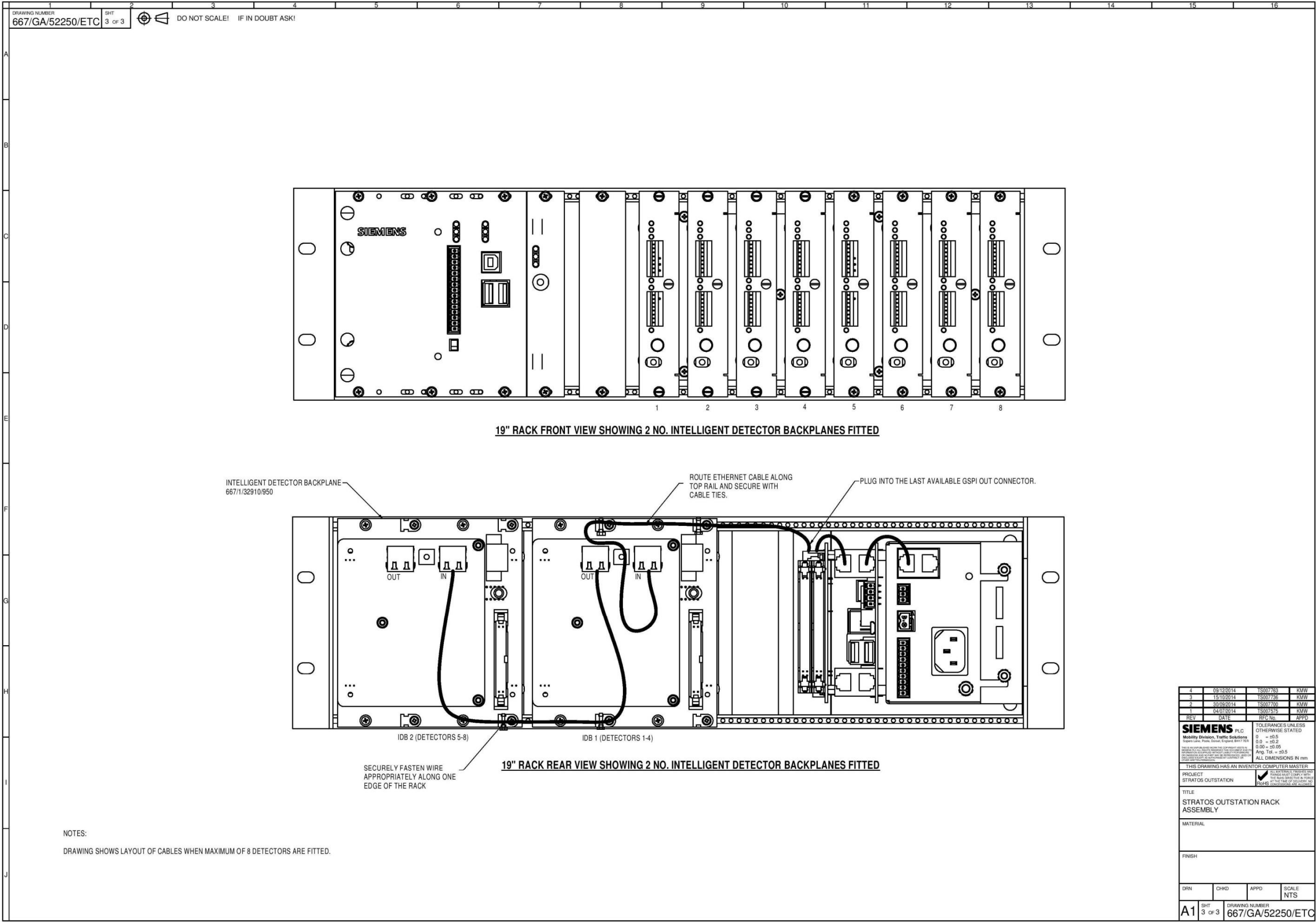
FINISH:

DRN: CHD: APPD: SCALE: NTS

A1 SHT 1 OF 3 DRAWING NUMBER: 667/GA/52250/ETC

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4	09/12/2014	TS007753	KMW
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1	24/07/2014	TS007375	KMW
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TITLE		STRATOS OUTSTATION RACK ASSEMBLY	
MATERIAL			
FINISH			
DRN	CHKD	APPD	SCALE
A1	SHT 3 OF 3	DRAWING NUMBER 667/GA/52250/ETC	NTS

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